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THE BABUL MEADOWS OF THE SHOLAPUR DISTRICTS.

By R. FAGAN, *Assistant Conservator of Forests, Bombay.*

INTRODUCTION.

MY chief object in writing this treatise is to bring the babul more prominently forward than it at present seems to be. It is the tree that is to be the principal species in the great reboisements now undertaken in the plain talukás of the Deccan. It is at present most shamefully grown, but nevertheless put to innumerable uses. If the growth of babul is increased and improved, the waste in the timber will be lessened, to say nothing of the advantages to commerce generally by the use of a good article instead of an indifferent one in constructions of all kinds. And further, there is no doubt that if its growth is increased the use of wood fuel will also be increased. I do not consider that this treatise is by any means exhaustive or infallible, and I shall be glad to receive any information in correction of, or in addition to, the remarks I have made.

CHAPTER I.

The Babul Meadows of the Sholapur Districts, their origin and existence.

Lignified vegetation of Sholapur.—It is often stated that a more treeless country than the Sholapur Districts does not exist in the Bombay presidency. This is an error which arises from the fact that the country is one vast undulating tract of land, and were you to stand on the highest vantage ground, yet in the neighbouring dip there might be an excellent babul meadow not 500 yards off, and you would never see it. The points visible to the eye in taking in the landscape are only the "mals" or summits of the undulations, and these are bare indeed. There are many causes to account for this bareness, such as the poor-

ness of the soil, murrum and other rock of basaltic nature being within one-quarter of an inch of the surface. Again, these uplands are the sheep pastures of a great sheep-rearing district, and this is enough to justify the absence of trees, leaving out of the question fires and other enemies of lignified vegetation.

I repeat that the plains of Sholapur are not treeless, and that the quantity of wood grown will compare favourably with that of any of the plain talukás of the neighbouring Districts. How could wood sell at the Sholapur spinning mills at Rs. 5 to 6 per ton, and at the Barsi mills at Rs. 3 to 4 per ton, and for less than the labour employed to fell it in the villages remote from large towns. It is in the dips or "lawans" that one must look for lignified vegetation. These lawans are annually refreshed with soil washed during the rains from the "mals," which have not sufficient vegetation to retain any detritus or disintegrated portions of the rock. This detritus is of the richest kind, and forms the black soil of the Deccan. It leaves the "mals" little by little, but the process has been going on for many ages, as may be seen by the complete absence of abrupt scarps.

Origin of the Babul meadow.—But to proceed, it is then in these "lawans," choked with the best of soils, that babul and other trees are to be found in abundance. Let a field of this soil be overrun by sheep and goats (after the crop is taken off) in the month of April, when these ruminants are fed on babul seed, the next year a thick crop of babul seedlings will be the result. Let this be protected from the teeth of the originators, and in two years no one will be able to cross it, so dense will be the growth. It is only in times of a famine extending over several years that frequent examples of what I have stated can be found. The plough soon asserts its own, the ruthless hand of the shepherd cuts the leading shoot of each babul to feed his herd, the lower branches are pulled at, eaten and destroyed by the flock. And what remains? A hideous set of stumps around each field which live a while in spite even of the human scarecrows who deprive them of every branch once a year, and these bābuls grow up torded worm-eaten miserable creatures of the vegetable kingdom.

Absence of large specimens.—I believe myself that there are few trees in the Deccan more picturesque and with more subtle outlines than a babul grown under favourable circumstances. Given protection and a fair soil its dimensions are very respectable. In 1881 there was a babul about 40 years of age growing in the Gursala reserve, Pandharpur, full 80 feet high, with a girth of 14 feet measured breast high, a larger one than this was felled in the same reserve some 3 years previous to the above date.

There are meadows in the Sholapur Districts which used to be under a "quasi" protection before the advent of the For-

est Department, and in these one does find some fairly grown trees, but the district generally shows very poor specimens. For the origin of these trees was as above described, and they were not allowed to be swept away for cultivation. The order being that the trees on these waste lands open to grazing were the property of the Government and not to be cut. This rule was never rigorously enforced, and it was solely in Kurans, where sheep and other cattle could not graze during the greater portion of the growing season (the monsoon), owing to the state of the soil, that vegetation got a rest, and consequently a start of its enemies, and grew in spite of them. But scarce a tree escaped mutilation to some extent, and in 1881 there was not one completely sound babul tree over 7 years of age in Sholapur.

Actual condition of the old Babul meadows.—These babul Kurans then were allowed to grow as best they could. Certain meadows escaped beyond the powers of sheep and goats, and look very respectable groves to the uninitiated eye ; they however present the same appearance at 20 years that they did at 15 and that they will at 30. They are formed of trees (*en état très clair*) that run about 30 to 40 feet high, and are every one unsound. The amount of wood to be got from them varies between a half to a whole candy of 784 lbs., but seldom more. There is no deceiving oneself in entering a reserve of this nature. The trees are past maturity, or they rot more per annum than they grow, and should be cleared away to give place to a fresh and properly protected growth. And why this halt in growth? I have heard it asserted that babul commences to rot after it has attained 4 feet in girth. Rather before that I think, considering the treatment it is exposed to. The real reason of the halt is, the trees are stunted and rotten because they have been so badly treated, and not because they are 4 feet in girth. Babul will grow to the dimensions I have mentioned above if only left alone and the soil be suitable.

Future of the Babul meadow.—Such is the origin and growth of the babul meadow when left to the sweet devices of Dhondiba the *dangar* and Ragu the *mahr*. What the babul meadow will eventually become, when regenerated and grown to maturity under strict conservation in these Districts, may still be a matter of conjecture, but one conjecture is pretty certain of being true, viz., that it will produce the maximum amount of sound timber that the soil is capable of, together with the maximum diameter possible for each tree to obtain, and given the soil good and protection perfect, the babul will be more than 4 feet in girth.

Chapter II.

Characteristics and uses.—The babul (*Acacia arabica*) belongs to the great order of the *Leguminosæ*.

Locality.—It is found from the Punjab to Behar in the Western Peninsula, in Ceylon, in Hindustan, and again in Arabia, Egypt, Tropical Africa and in Natal.

Soil.—In the Sholapur Districts it is found growing well in the deep black soils, but to the greatest advantage in the white sandy soils thrown up along the banks of rivers. It grows in a more or less stunted condition on the worst soils of these districts, such as the calcareous soil formed almost entirely of "kankar," and known locally as "chopan jamin," and it forms a scrubby bush even on the mals themselves. Irrespective of the constituent elements of the soil, I should say the most suitable soil for the babul is one that remains fresh even during the greatest droughts. Babuls exist on drier soils than this, but their existence is not natural, as they remain bared of leaves from April to end of May.

Climate.—The most suitable climate for the babul is of course tropical, and as it grows so well in the Deccan, great humidity in the atmosphere is not essential but beneficial. As far as elevation above sea level is concerned, it is impossible to fix the maximum and minimum at which babul is to be found in the Sholapur Districts, for it is found everywhere in this vast plateau.

Bark.—The bark varies from rugged and black on the trunk to soft and downy green on the youngest branches.

Branches.—The year's branches are very straight, but become torded and straggling with age. The cover is nevertheless light.

Trunk.—The trunk of the tree has invariably the appearance of "fibre-torse," the fibres of the bark twisting round the stem in a spiral.

Leaves.—The leaves are composite, the leaflets of a delicate green, of $\frac{1}{8}$th to $\frac{1}{4}$th of an inch in length.

Flower.—The flower is globular in shape of $\frac{1}{2}$ inch diameter, and yellow and sweetly scented.

Fruit.—The pods are coriaceous, hanging downwards, several in number, with 8 or 12 seeds in each. The length of the pod varies from 3 to 6 inches by $\frac{1}{4}$ to $\frac{1}{2}$ inch in breadth.

Spines.—The branches are covered with spines, which are extremely hard and piercing on the older branches.

The root is a tap root, there are also minor buttress-like roots which ramify in all directions close to the surface.

Sap and ripe wood.—The sapwood is white, the ripe wood darkens from the exterior, where it is brown to almost black at the centre. There are seldom more than four annual rings of sapwood. The sapwood is soft and porous, the ripe is hard and seems to lose the porous qualities with age, owing to the secretion of gum in its tissues. The wood just above and all below the "collet" of the tree is the hardest and most prized.

Variety of the Babul.—There is a variety of the babul common in the Sholapur Districts known as the "Ram Kati;" I

have never been able to ascertain, but it appears to me that it is an accidental variety that may spring from the seeds of the common babul. It is in all points, except shape and ramification, similar to the common babul. This tree resembles in stem and ramification the Italian poplar so common on continental roadsides.

Uses of the Babul.—The uses of this tree are innumerable. Its timber is used for making the famous Bijapur cart, for lintels and door posts, window frames, the panelling of light carriages of native manufacture, in planks for shutters, for ploughs, yokes, and that portion mentioned above as the most prized is used for oil mortars. I have never found it used for beams or rafters in any moderate sized dwelling, which would lead one to the conclusion that it has not good lasting qualities. So much for the ripe timber. The wood of the branches and unsound stems make excellent fuel. The fruit is used for feeding sheep, and forms a great source of support to them during the hot weather when grazing is not available. The bark is highly valued by the tanner and dyer. Further, this tree secretes in its sapwood the well known 'false' gum arabic, which is in a semi-liquid state during the months of February, March and April, and should a branch be broken or a portion of the stem punctured or injured, the gum escapes; but the quantities in which the gum deposits are very small, and I have not discovered any means by which the collection could be made remunerative in Sholapur.

Age.—The common babul lives to about 60 years in these Districts. The approach of death is easily determined by the extremities of the branches drying and bearing a square-tipped appearance. These branches eventually die and rotting infiltrate rain water to the trunk, which in turn rots.

Defects, &c.—Attacks by insects.—This tree often succumbs in its youth to the attack of the larvæ of the various species of the carpenter bee (*Xylocopa*). The largest of these larvæ, which all go by the name of "Humany," is about 1½ inches long, nearly as thick as an ordinary man's thumb, and may be black, red or even white. The larvæ attacks a tree in full vigour, sawing the tap root as cleanly as if the operation had been performed with a saw. I have, however, never seen trees of a greater dimension than 6 inches diameter at the soil attacked in this way. When the tree first shows signs of disease, it is just possible to find and kill the grubs, but if the tree is dead they will not be found, having left, owing to the nourishment from the juices of the tree ceasing. The trees of 6 inches diameter and larger are generally attacked by several of the grubs, which also I feel confident have the power of destroying the life of the subject attacked, but the cause is not direct, but emanates from the decay caused. This insect generally may be said to kill outright young babuls of one or two year's growth.

Another insect not unlike the common river cadiz worm, only that it lives on land and not in water, attacks this tree in full vigour, but does it little harm. It strips the spines off the branches, and builds itself a hut therewith, and seems to nourish itself by nibbling the bark of the youngest shoots so much so that one is often led to believe that a young tree when covered by many of these worms is dying. I know of no other animal that attacks the cambium bark or wood of the babul as long as its wood remains sound. As soon as the tree becomes rotten, or has a rotten portion near the surface, it is attacked by innumerable animals, and the carpenter bee lays its eggs in any cavity that presents itself, its young boring deep holes which permit infiltration of rain water. 'Maunder' asserts that the bee itself has powerful jaws and bores, of this I have my doubts.

Dry Rot.—All other defects in this wood may be summed up in the words "dry rot," which arises from some accident by which the cambium has been exposed and continuity in the tissues broken, *e.g.*, barking and lopping off a large branch, the end of which dries and rots, and thus carries infection to the stem of the tree. I may be wrong, but I have never on all the sections of babul that I have examined, discovered a spontaneous defect in the tree. All flaws having been traced to one or other of the above sources. I am, therefore, unable to reconcile what I have so often heard stated, that the babul rots on attaining 4 feet girth, or what must be the same thing a certain age. Now I have seen trees perfectly sound over 4 feet girth, and the girth of the tree does not depend so much on its age as on the soil it grows in; moreover, if this dimension was the limit after which spontaneous decay commenced, then it surely ought to commence in the centre or oldest portion of the tree, but I have never seen one case of this, all defects were owing to exterior causes.

Age and size not the only cause of decay in large and mature trees.—I will now proceed to give some examples of what I have actually seen on this head. A babul showing signs of maturity was felled in a departmental felling, it measured 6 feet girth at 5 feet from the ground. It was an exceptionally well protected tree, and I estimated its age when down at 50 years. The stem was sawn into lengths 6 feet long by the purchaser, and on all the sections not a sign of decay had set in.

On another babul 7 feet in girth I discovered a section such as *Fig.* 1, from which it was apparent that in the fifth year of growth of that level, a branch had been clean lopped or the tree barked. From *ab* as base two triangles *abc* and *abd* were formed by "dry-rot" of a darker colour than the wood. The apex of the former triangle being at the centre of the tree, and the apex of the latter at the point where the bark had rejoined. I noticed at *ef* on the vertical section a circular blur, and from *d* to *g* horizontally a line of light coloured tissue running

BABUL MEADOWS OF THE SHOLAPUR DISTRICT.

Fig. 1.

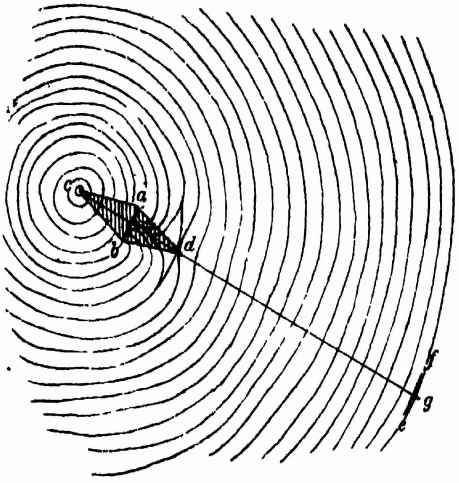


Fig. 2.

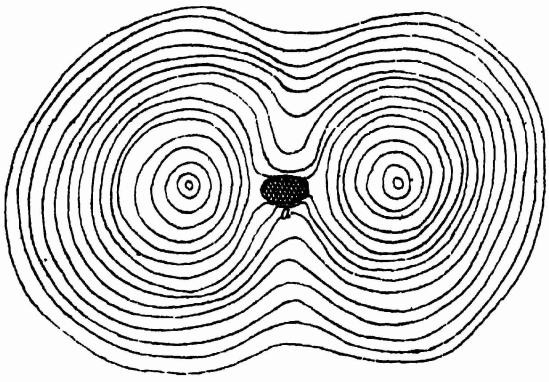
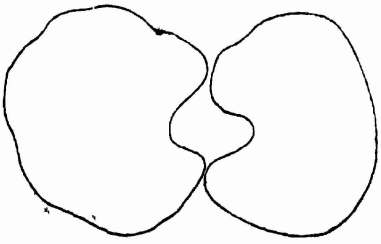


Fig. 3.



Litho. T. C. Press, Roorkee. THOS. D. BONA, *Supdt.*

through those points of the annual rings, where they bent in conformity to the one they covered. The wood was rotten in these two triangles, and could be picked out easily with a knife. The disease it will be seen was evidently greatest where it had first commenced, and I noticed it was spreading upwards and downwards more than horizontally. This was doubtlessly caused by the peculiar run of the fibres which lie end to end in the vertical sense, thus offering themselves in the ascent and descent of the sap more easily to decay, there being but little horizontal flow of fluid matter between these tissues. All the forms of rot had this peculiar section, the outside mark on the bark differing according to the primary cause.

I once found in the part *abd* instead of the darkened portion the stump of the branch that had been lopped off in years gone by. It was closed over by the annual rings and shut in hermetically, but too late to prevent decay, and the same phenomenon occurred in *abc*. Again, a more conclusive case came under my observation where the triangle *abc* had not its apex in the centre, but would have had it after a sufficient amount of time. This clearly shows, I think, that rot does not emanate from the centre, or oldest portion of the tree.

I had often enquired of natives whether they could show me a tree where the rot emanated from the centre, as they themselves say the babul rots while growing from the centre. One man told me he had a case to show me; I found in the centre of the tree, true enough, a black spot about the size of the palm of the hand. I picked at this black lump, and eventually got it out, it was nothing more or less than a piece of bark. And now to explain! The black spot is represented in *Fig.* 2 at *a*, and what the man considered the centre and oldest portion of the tree was nothing more than the point of contact of two trees which had joined and grown into one stem. The pressure having caused the bark to yield on the outer phlanges of two projecting buttresses, and the cambium of the two trees uniting the portion between the two projections got closed in, as shown in a somewhat exaggerated form in *Fig.* 3, and far from being rotten it was perfectly sound.

(To be continued.)

PROGRESS OF FORESTRY IN INDIA.*

By D. Brandis, Ph. D., F.R.S., C.I.E.

The long period of peace, of good and just government, which followed the consolidation of the British Indian Empire, the construction of railways and other public works, and the rapid increase of trade and prosperity, have contributed much to ac-

* Written for the Journal of the Scottish Arboricultural Society.

celerate the destruction of forests in India. Over large districts and entire provinces the forests have been cleared to make way for the plough and the increasing population, and when forests were left, most of the accessible timber was cut and brought away to be used as fuel and charcoal, for shipbuilding, for railway sleepers, for bridges and other buildings.

Hence it came to pass that forests, which in old days were regarded as a thing to be got rid of and as an obstacle to civilisation, attracted attention, and that the necessity of preserving them began to be considered. As early as 1844, Mr. Conolly, then Collector of Malabar, commenced planting teak on a large scale at Nilambur, in his district, in order to provide timber when the forests, which were rapidly disappearing, should be exhausted. In 1839 and 1840 the Government of the Bombay Presidency issued orders to stop the cutting of teak wood on Government land, and in 1847 Dr. Gibson was appointed Conservator of Forests in Bombay. In the same year Mr. Colvin, Commissioner of the Tenasserim provinces, commenced organising a Forest Department at Moulmein ; and in 1856 Dr. Cleghorn was appointed the first Conservator of Forests in the Madras Presidency. Five years later, in 1861, Dr. Cleghorn was deputed to the Punjab to examine the forests in the Western Himalaya, and in 1866 he was selected to officiate as Inspector-General of Forests.

The system which has now been accepted in the two Presidencies of Madras and Bombay and generally throughout India, consists in this, that from among the vast area of forest and waste which is at the disposal of the State, certain lands are selected and demarcated, which are called Reserved Forests. They might have been called State forests in accordance with the practice which obtains in those countries of Europe where the development of forest management has been analogous to what has taken place in India. The Reserved Forests in India are State forests in the sense in which this term is used in France, Germany, Austria, Denmark, and other countries of Europe ; but they are not the only forest lands at the disposal of the State, and hence they are for the present called Reserved Forests.

The administration of forests generally, and in particular the constitution of these Reserved Forests and the procedure by which they are gradually freed from customary rights, which villagers and private persons have been in the habit of exercising in them, are now regulated by legislative enactments. The Indian Forest Act was passed in 1878, the Burma Forest Act in 1881, and the Madras Forest Act in 1882. Other local enactments are in force in several districts and provinces where peculiar circumstances required special legislation. In the review of forest administration for the year ending March 1882, written by Dr. Schlich, Inspector-General of Forests to

the Government of India, the total area of Reserved Forests on that date is stated as follows :—

	Sq Miles.
In the provinces under the Government of India,	35,242
Less second class Reserves in the Central Provinces,	16,842
	18,400
In the Madras Presidency, ...	1,182
„ Bombay „	9,789
Total, ...	29,371

A word should be said regarding the second class reserves in the Central Provinces. Legally they are reserved forests like those of the first class ; no fresh customary rights can accrue in them, and no land can be alienated without the sanction of Government. But they have not been protected strictly, as the first class reserves have been, their boundaries are not clearly marked on the ground, and they are cut up by cultivation, which has frequently been permitted in them without fixing the limits within which it may be carried on. Eventually a portion of these second class reserves will probably be given up for cultivation, while the remainder will be strictly protected and added to the first class reserves. In the Central Provinces, as elsewhere, the policy followed has been, in the first instance, to concentrate operations upon limited areas ; but now, since an efficient staff of forest officers has gradually been organised, it has been found possible to expand operations and to take in hand larger areas. In the area shown as Reserved Forests are included 402 square miles of forests leased from Native States, chiefly in the North-West Himalaya. In all provinces large additions to the reserved area are steadily made, chiefly in the Presidency of Madras, where the work of forming Reserved Forests has hitherto been backward.

The extent of country under British administration in India, not including Native States, may be put down at 870,000 square miles, of which about 246,400 square miles, or 28 per cent., is cultivated, while the rest, or 623,600 square miles, is forest, waste and pasture land ; much of this, however, is private property, and the total area of forest land at the disposal of the State is not in all provinces accurately known. The Reserves it is intended to maintain permanently as forest, and the remaining lands at the disposal of Government will be available either for the further extension of the State forests when such may be found necessary, for the formation of village forests to be managed by the village communities for their own benefit, for pasture lands, or for the extension of cultivation.

The trees of which the Indian forests consist are entirely different from those common in Europe. The variety of trees is

much greater; in Great Britain there are only about 40 species of indigenous trees, while in India they number over 2,000. Only in the temperate climate of the North-Western Himalaya is the general character of the forests similar to that in Europe, and there are even a few kinds which are common to both countries, such as the yew and the boxwood. Here are found forests of oaks and coniferous trees, with an admixture of maples, elms, hornbeam, birch and poplars; the banks of streams are lined by tall alders; the shrubs and underwood consist of willows, barberries, roses, and brambles. The genera are often the same, but the species are almost all different, and with them are associated many kinds which have nothing in common with the trees and shrubs of Europe. In these forests the most important tree is the deodar *(Cedrus Deodara)*, which forms extensive forests at an elevation of between 6,000 and 9,500 feet; these forests are rarely pure, but the deodar is largely mixed with other less valuable trees, partly conifers, partly oaks, and others. The value of this noble tree, which under favourable conditions attains a height of over 200 feet, consists in the great durability of its timber. In the climate of India most woods are apt to decay and to be destroyed by insects a few years after having been cut. Deodar is one of the few durable woods in India, and beams of it have been known to last several hundred years.

A large belt of forest stretches at the foot of the Himalaya from the Punjab to Assam, and the two most valuable trees in this forest belt are sal *(Shorea robusta)* and sissú *(Dalbergia Sissoo)*. As in the case of deodar, their value consists mainly in the durability of their timber. Sal belongs to the natural order of *Dipterocarpeæ*, which has no representative in Europe, and is remarkable from the long wings on the tops of the large round seed. This tree is eminently gregarious, and on the stretches of high land between the rivers which issue from the hills, it forms extensive forests, almost pure, the ground under the old trees being generally covered with a dense mass of seedlings. The sissú tree, which belongs to the natural order of the Furze, the Robinia, and the Laburnum, forms forests, partly by itself, partly associated with the Cutch tree *(Acacia Catechu)* and other kinds, near the rivers and on the deposits of sand and shingle which extend along their banks. Sissú extends far up the valleys into the hills to an elevation of 3,000 feet. The timber, which takes a fine polish, has not the great hardness of sal and works better; it is used largely for furniture and carriage-building. Extensive plantations of sissú have been formed, chiefly in the Punjab, and the establishment of a good system of rearing sissú on a large scale, and at a moderate cost, is due mainly to Mr. B. Ribbentrop, the Conservator of Forests in that province. *Acacia Catechu* is not, like sissú, limited to the sub-Himalayan forests, but is also found in Burma and other parts of tropical India; its dark red heartwood is extremely durable,

and is prized for pestles of oil mills, for rafters and house posts. But the most valuable product of the tree is Cutch or Catechu, an excellent tanning material, which is extracted by simmering chips of the heartwood in water, and boiling down the red fluid into a hard shining black mass—the Catechu of commerce.

In the moist climate of Assam, where the sal tree attains its eastern limit, the India-rubber tree (*Ficus elastica*) is found in the dense evergreen forests at the foot and in the valleys of the Himalaya and of the Naga Hills, which bound the Assam valley on the south. This is a huge evergreen tree of the fig tribe, with thick leathery shining leaves, which sends numerous aërial roots down to the ground from its branches. The white milk which exudes from cuts made in the stem and roots is collected and dried, and forms the caoutchouc which is exported from Calcutta. The tree is found chiefly outside British territory in the hills which surround the Assam valley, and which extend from the head of that valley north towards Arrakan, as well as in Native Burma, north of Bhamo. The export of this article from India in 1881-82 amounted to 10,680 cwt., valued at £108,843 ; but owing to the reckless treatment of the trees in tapping, this supply, which mainly comes from beyond the frontier, must eventually diminish, and hence it became necessary to establish plantations. In Assam 1,000 acres are now stocked with *Ficus elastica*, some of the trees being nearly ten years old, and those in the older portions being from 30 to 40 feet high. The success of these important operations is chiefly due to the skill and perseverance of Mr. Gustav Mann, the Conservator of Forests in Assam. The caoutchouc plantations are being steadily extended.

Sandalwood (*Santalum album*) is a small evergreen tree, with elegant hanging branches and black berries, the heartwood of which is valuable on account of its strong scent. It is used as incense and for carving, and is largely exported, chiefly to China. The native State of Mysore in South India is its chief habitat, but it is also found in the adjoining districts of the Madras Presidency, in Coorg, and in North Canara.

Of all Indian forest trees the most important is the teak (*Tectona grandis*), a deciduous tree of the natural order of *Verbenaceæ*, to which *Vitex* and *Verbena* belong, with large rough leaves, often 3 feet long. This tree is found associated with bamboos and a great variety of other trees, most of which have no, or very little, market value. Pure natural teak forests are rare, but they are sometimes found on dry and poor soil. In the island of Java teak is described as a more gregarious tree than it is in India ; but the home of teak is in the moister regions of tropical India, and the most extensive teak-producing forests are in the Trans-Gangetic Peninsula, in Burma, and Siam. In Central India and on the Irrawadi river it extends to north latitude 26°.

It may justly be said that teak is among woods what gold is among metals,—it is not only exceedingly durable, but it works well, takes a fine polish, does not split or warp, and is neither very hard nor very heavy. The only timber, which might in some respects take a higher rank, is mahogany. Indian teak is more prized than any other timber, and it forms an important article of export from Burma to Europe and America; but the only ports where teak is now shipped in large quantities are Rangoon and Moulmein in Burma, and Bankok in Siam. Its price is exceedingly high at the present time,—as much as £15 to £16 the load of 50 cubic feet in the London market.

The following figures, which show the imports from all sources, foreign and British, into the ports of Rangoon and Moulmein, as well as the exports from these ports, all in loads or tons of 50 cubic feet, will give some idea of the great increase in the consumption of this timber since 1856. The figures are annual means for periods of eight, five, and three years :—

Periods.	Mean Annual Imports. Tons.	Exports. Tons.
8 Years, 1856-57 to 1863-64, ...	85,000	77,000
5 „ 1864-65 to 1868-69, ...	113,000	108,000
5 „ 1869-70 to 1873-74, ...	133,000	98,000
5 „ 1874-75 to 1878-79, ...	227,000	135,000
3 „ 1879-80 to 1880-81, ...	169,000	135,000

During the last three years the mean annual yield of the Government forests in British Burma was 24,000 tons, and the imports from beyond the frontier amounted to 145,000 tons. But the forests beyond the frontier are worked without any regard to their maintenance, and it is impossible that they can much longer continue to yield the same quantities as hitherto. On the other hand the yield of the Government forests may be expected to increase considerably, and the aim is to increase the proportion of teak in these forests by protection and planting to such an extent as to enable them to yield annually and permanently a quantity equivalent to the timber at present imported into Rangoon and Moulmein. There are not many places where teak is found outside India and the Trans-Gangetic Peninsula; but the Burma ports and Bankok have not altogether the monopoly of this valuable timber. The teak forests of Java are reported to have an area of 2,280 square miles; they are under regular management by a Government Forest Department, and during the fifteen years from 1865 to 1880, 24,700 acres have been planted up. The natural teak (Djati) forests of that island, of which a graphic description is given in Junghuhn's excellent work on Java, are situated in the eastern or drier portion of the island, and, like the Indian teak forests, they were formerly overrun by the annual forest fires of the dry season. The stature

of the trees in the Java forests is described as small, only 50 to 60 feet on an average; while in Burma and near the Western Ghats the teak attains 100 feet and often more. Protection against fire will probably have the same beneficial effect in Java as in India, and the forests of that island may eventually be expected to contribute their share to the teak required by the world's trade.

There is a class of plants which gives a peculiar character to most Indian forests, and this is the bamboo. They are tall arborescent grasses, generally growing in dense clumps, consisting of numerous slender stems, often 60 feet high and more. The stems are hollow, light, and very strong, and they furnish most valuable material for building; but they are also used to make baskets and mats, and the walls, floors, and even the roofs of houses are often made of stout bamboo matting. The demand for bamboos is very large, many millions being annually floated down from the Burma forests, and they are exported from most of the larger forest districts in India. Only in some remote districts are the bamboos as yet without value. A project was started a few years ago to use the fresh shoots of the bamboo for the manufacture of paper, and extensive concessions were made by Government to the promoters of this project. Excellent paper from bamboo is made in China, and there seems no doubt that fresh bamboo shoots yield one of the most valuable of paper stuffs. But in most districts the stems fetch much more when mature than the paper maker could afford to pay for the fresh shoots, and in those remote districts where bamboos have as yet no value, the unhealthiness of the forests, the scarcity of labour, and other difficulties are in the way of this undertaking.

Besides the trees indigenous to India, much has been done to introduce trees from other countries, and in some instances they have succeeded remarkably well.

Of the trees of Northern Europe or of North America, none have been raised on a large scale, the climate being totally different. The olive, the sweet chestnut, the carob (*Ceratonia siliqua*), and some other trees of South Europe, have been introduced into Northern India, and of these the sweet chestnut promises to thrive well in some portions of the North-West Himalaya. The mahogany tree was brought from the West Indies about ninety years ago, and there are a number of large trees in gardens near Calcutta, which produce timber equal to that of the American tree. Great exertions have been made to grow this tree on a large scale in forests, but the success has, with few exceptions, been indifferent; in Pegu, however, there seems some prospect of the mahogany succeeding as a forest tree. An introduction from tropical America, the rain tree (*Pithecolobium Saman*), whose timber has no value, but which is remarkable on account of its extremely rapid growth, has suc-

ceeded wonderfully well in most of the moister districts of tropical India. Attempts have been made with great perseverance, and at considerable expense, to introduce several of the tropical American trees which yield Caoutchouc, and one of these, the Ceara rubber (*Manihot Glaziovii*), has been found to grow freely in the moister districts of tropical India.

The paper mulberry of Japan (*Broussonetia papyrifera*), which yields also the tapa cloth of the South Sea islands, is now cultivated in Assam and Burma, and promises to be an important introduction. In Japan, this tree is grown as coppice, in the same way as osier beds in England; and, if the experiments continue successful, its fibre may become a valuable forest product in India.

The most remarkable instance of a foreign tree is the Australian blue gum (*Eucalyptus globulus*) on the Nilgiris. Of this, as well as of two species of acacia, *viz.*, *A. dealbata* the wattle, and *A. Melanoxylon* the blackwood, forests have been raised, and around the stations on the hills these trees are now so numerous that they give a peculiar character to the landscape. The blue gum was first introduced in 1843, and there are trees at Ootacamund now thirty years old, over 13 feet in girth, and over 110 feet high. When young the tree shoots up with great rapidity, and under favourable circumstances trees ten years old are 80 feet high, with a girth of from 2 to 3 feet. After that age the growth in height is less—only about 2 feet a year, but they add greatly to their girth. 1,230 acres on the Nilgiris, on that portion of the plateau which is occupied by native villages and by European planters, have been planted by Government with the blue gum and acacia. The indigenous woods have here been largely cleared: those which remain are not very extensive, and the indigenous trees have an exceedingly slow rate of growth, so that the introduction of these fast-growing Australian trees has been most useful for the supply of timber and fuel. In order to ascertain exactly the rate of wood production per acre, valuation surveys were made in the summer of 1882 by Mr. D. E. Hutchins, then Assistant Conservator of Forests in Mysore, with the result, that in the plantations ten years old the stock standing on one acre measured 6,800, and in a plantation nineteen years old, 9,000 cubic feet of solid wood. The mean annual production of wood in these blue gum plantations, therefore, has up to date been at the rate of about ten tons, or 500 cubic feet of solid wood, per acre, which is more than five times the quantity produced by high timber forests in Europe. The acacias grow less rapidly, and they produce only about half the mean annual quantity per acre, but still they do much better than any of the indigenous woods.

The successful introduction of the larch and the Austrian and Corsican pines into Great Britain, and of many North American trees into Europe, justify the expectation that forests of a few

foreign species may be raised in India ; but even these brief remarks will serve to show that in India trees may succeed well in gardens, and yet not answer when grown on a large scale in forests.

Forest management in India has commenced to yield a steady and growing annual revenue to the State. This revenue might be much larger if the forests were not managed with the chief object of improving their condition ; hitherto cuttings have been restricted, and attention has been chiefly devoted to the formation and improvement of these Government domains. In the provinces immediately under the Government of India, the forests yielded in 1881-82 a revenue of £631,500, while the charges amounted to £393,000. Of this outlay £290,000 was expended upon cutting and carriage of timber and other matters connected with the collection of revenue ; while on the formation, protection and improvement of the forests the outlay was £103,000. But the revenue is increasing steadily, and may be expected to reach a very large figure. In 1864 the first attempt was made to put together the financial results of forest administration in the different provinces, and the progress which has been made since that time will be seen by comparing the average annual figures of the five years commencing with 1864-65, with the figures for 1881-82 and 1882-83. These figures include receipts and charges of the provinces immediately under the Government of India, as well as of the Presidencies of Madras and Bombay.*

	1864-65 to 1868-69 Average per Year	1881-82.	1882-83.
Revenue,	... £360,000	£870,000	£950,000
Expenditure,	... 220,000	550,000	600,000
Surplus,	... £140,000	£320,000	£350,000

By way of comparison, the average receipts and charges of the State forests in France and Prussia will here be stated. The figures for France are taken from the "Annuaire des eaux et Forêts" for 1884, and it should be noted that the receipts are those for 1880, while area and charges relate to 1884. The figures for Prussia are taken from the "Forst und Jagd Kalender" for 1884, and all relate to 1883-84. In both countries the State forest officers have also the general control of a large area of communal forests. The receipts include only cash receipts, and not the value of wood and other forest produce given gratuitously to right-holders and others. Outlay of capital and extraordinary charges, such as those for the construction of roads and buildings, the planting up of large areas of waste, and the operations for restoring the forest growth on low mountains in France, are included in the current expenditure of the

* The Forest Revenue for the three Presidencies in 1883-84 has been £1,040,000.

year, and this is also the practice in India. The figures for France do not include those relating to the forests in Algeria.

	France.	Prussia.
Area in square miles, ...	3,876	10,246
„ in hectares, ...	1,003,948	2,653,913
Revenue, ...	£1,405,104	£2,618,570
Expenditure, ...	641,508	1,625,725
Surplus, ...	£763,596	£992,845

Both in France and Prussia the gross and net revenue per square mile is much larger than in India. A comparison of the rates per square mile would be without meaning, as part of the Indian forest revenue is derived from areas outside the Reserved Forests, while for France and Prussia the figures only represent the revenue of the State Forests. In these countries regular and systematic forest management has existed for several centuries, and the result may be seen in well-stocked forests, with a regular gradation of ages, which yield large annual crops of timber and other forest produce. In India the first real attempt to introduce systematic forest management is barely 30 years old.

But though the working of the Indian forests is as yet in its infancy, the principles followed are the same as those upon which the State Forests of France and Prussia are worked, the chief aim being steadily to inprove their condition, and never to cut more than the annual production by natural or artificial means will justify. Forest management, which aims at these objects, requires the following measures as essential conditions of success. *First*, effective protection; *second*, a good system to secure the regeneration of the forest, either naturally by self-sown seedlings or coppice shoots, or artificially by planting, sowing, and other cultural operations; *third*, good lines of communication to facilitate protection, the working of the forest, and the export of produce; and *fourth*, well considered and methodically arranged plans of working.

In the matter of protection, great success has been achieved, and the beneficial effects manifest themselves in the improved condition of the forests. One of the main points gained has been that over large areas it has been possible to put a stop to the annual forest fires. As is well known, one of the peculiarities of the Indian climate is that in most parts of the country the year is divided into a dry and a wet season. During the dry season, which never lasts less than five months, but generally much longer, the grass and herbs, the leaves, twigs, and rootlets on the ground get so exceedingly dried up, that a spark is sufficient to set large tracts on fire. Only the dense evergreen forests of the Himalaya and of the moistest regions of

India are safe from these fires; but in the deciduous forests which prevail in the plains and on the lower hills, the fires of the dry season are an annually recurring event. They are lighted by the hunter to clear the ground; by the herdsmen, who burn the old grass in order to get fresh herbage for their cattle; by the hill tribes, who raise their crops of rice or millet in the ashes of the forest, which they cut and burn; or they originate through the carelessness of travellers. The injury done by these fires to the forests is incalculable; trees are killed or hopelessly injured; seed and seedlings are destroyed wholesale; and the ground is hardened and impoverished. In the provinces under the Government of India, 4,283 square miles out of 18,400 were effectually protected in 1881-82. In some provinces a much larger proportion was reported to have been saved; thus, in the Central Provinces, one-half of the first class reserves was without fires in 1881-82, and in Berar two-thirds. When the idea was first started it was denounced as Utopian, and the attempt to put a stop to the annual jungle fires was regarded as a hopeless undertaking. Success was only achieved through indomitable perseverance, and at the cost of great personal exertion and exposure during the hottest part of the year. In the Central Provinces success in this respect has been chiefly due to the energy and perseverance of Colonel G. F. Pearson, who was appointed Conservator in 1863, and of Colonel Doveton, who succeeded him in 1868.

The reward has been a wonderful change in the condition of the forests. Before protection commenced they were often nothing but a thin and open scrub, with here and there a few trees which had managed to grow in spite of the fires. Year after year, as fire protection continued, this open scrub was replaced by a dense growth of trees, bamboos and shrubs, and the large blanks, formerly covered with high grass, gradually got stocked with self-sown seedlings and coppice shoots. The task of continuously protecting those forests against the annual fires would be hopeless, if the grass, generally the chief source of danger, were not killed out by the dense cover of the forest, which has gradually become stocked. So far the improved condition of the growing stock. The improvement of the soil is equally important; but here a remarkable fact should be mentioned. Black moist vegetable mould, such as covers the ground in beech and other forests in Europe, has not yet been observed in the Indian fire-protected forests; and it should be added that such black vegetable mould is not found as a rule in the evergreen forests of tropical India, through which the annual fires do not pass. In the deciduous tropical and subtropical forests which are protected against fire, leaves and twigs crumble into dust during the dry season; the surface of the soil is dark coloured, but, as far as experience up to the present time has gone, no layer of moist vegetable mould is formed.

Fire protection benefits the less valuable kinds equally with those species which are valuable. Planting and other cultural operations are therefore necessary, not only in order to stock blanks, bare plains or hillsides, with trees, but also to increase the proportion of the more valuable species in the forests. For this is a peculiarity of forestry in most parts of India, that those trees the timber of which is marketable are often mixed with other kinds for which there is no demand. Thus, in what are called the teak forests of British Burma the teak tree forms a small proportion of the forests, less than 10 per cent., and hence it is of the utmost importance to plant teak and otherwise to favour the growth of this tree at the expense of the other less valuable kinds. From a late report on the Burma forests, it appears that up to the 31st March, 1883, 11,221 acres had been planted with teak. This, obviously, is only a small commencement, and teak must be planted on a much larger scale in Burma in order to place the forests in a position to yield eventually the large supply which it is hoped they will furnish. The difficulty hitherto has been that those tracts where the teak grows best are extremely feverish, and that labour is scarce and expensive. Several plans have been tried, but that which seems likely to lead to the best results is to induce the Karens, who inhabit these forests, to plant teak in their hill clearings (Toungyas), where they raise a crop of rice, with vegetables and a little cotton, in the forest which they have cut down and burnt. While the crop is on the ground, the teak remains small, but grows rapidly afterwards. Colonel Seaton, Conservator of Forests in the Tenasserim division of British Burma, has the great merit of having succeeded, in 1868, in starting this system, which had been first suggested in 1856. The bamboos, which form extensive forests in the teak region, mostly flower gregariously all at once over large tracts, and after ripening their seed they die; the stems of the bamboo fall, and the ground is covered with a dense mass of dry stems lying across each other. Attempts have been made during the last few years to burn and clear these areas and plant teak, and it is possible that this also may eventually be developed into a good system.

(To be continued.)

FORESTRY IN JAPAN.

BEING unable to spare time to write a full account of the International Forestry Exhibition just at present, I only send a short description of the Japanese Department, which I hope will prove interesting. This department struck me at once as being the one of most interest to us. The Japanese are commencing scientific forest conservancy much as we are, but they

are even fresher to the work, and I must say that in my opinion they are not lagging behind. The Japanese Commissioners were most courteous and gave me some details. The nucleus of the Department studied Forestry in Germany, and have now returned and started a Forest School in Japan. Unfortunately the head of the Forest Department (one of the Commissioners) can speak only Japanese, and it was difficult to obtain much information through an interpreter, especially as their modes of valuation are apparently peculiar. For instance, I was struck with the great number of workmen evidently employed on each work, and the liberal way in which work was carried on. I found contrary to my expectation that the cost of ordinary labour ruled rather higher than in Bombay, or say 6 annas a day, while skilled labourers, such as sawyers, &c., earned about Re. 1. The *Cryptomeria japonica* seems to be the great tree, and trees of 20 feet circumference were mentioned as common, and yet in reckoning up the profits the value of 'a tree on foot' was mentioned as one franc. I had great difficulty in explaining the difference between superior and subordinate staff, and am not sure that I really made myself understood, but the following figures were extracted for me from the administration report for 1880 :—

Total Superior Staff,	320.	Area of average charge	40 sq.m.
Total Subordinate Staff,	1,700.	„ „	12 sq.m.

But I was informed that this staff had been very much augmented during the past four years.

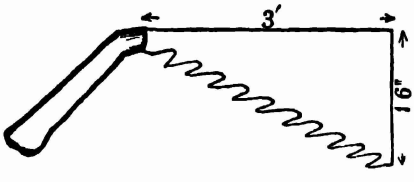
Among the exhibits I noted the following :—

A series of paintings of forest works. These are most interesting, and (though drawn in the perspective or rather want of perspective so familiar in Chinese pictures) give a capital idea of tree felling, timber slides, timber floating, sluices, weirs, &c. The trees represented are all of large size. Temporary beds are built on to which the trunks are made to fall (the tops and branches being first removed) by means of windlasses, and similar care to prevent damage is apparent everywhere in the slides and floating operations. I noticed one picture of felling by fire, but could not quite realize the details. It was an enormous tree, and apparently holes had been made through with the axe to cause a draft. All large wood is apparently squared on the spot before export. A series of models of weirs, sluices, slides, &c., are also very interesting. They are all constructed of materials found on the spot, *i.e.*, logs, creepers, bamboos, &c., and cages filled with stones are used as buttresses.

One model labelled "Weir at Awomari" shows particular ingenuity. It is evidently meant to obtain a head of water on a small stream, and so to produce an artificial freshet. The whole dam is of the roughest materials, and could be constructed with only an axe, and yet is evidently thoroughly efficient. The

gates closing the sluice are composed of planks, each one moored to the dam at the side of the sluice, and supported (against the current) in the centre by a vertical log, which is moored at top and kept in place at bottom by the end of a sapling in a socket. Above the sapling is put into or behind a 'catch,' made out of a forked stick, and a rope carried from the upper extremity of the sapling to the shore is the means by which the sluice can be thrown open. The whole idea seems to have been borrowed from a mouse trap.

There is a fair collection of implements and tools, including timber stamps, hammers, chisels, axes, hoes, spades, shovels, billhooks, saws, &c., &c. Some of these are of European and some of Native shapes, but all of Native make. The saws alone seem worthy of special remark. They are all one-handed and shaped thus, even the coarsest, having nearly 1 inch teeth,



were made thus. To me they seemed inferior to our double-handed saws. The triangular shape which is necessary (both pull and push being from the same end) to give strength and prevent the saw crippling must greatly increase the friction, and with the continuous labour must be a severe strain on the workman. However one of the Commissioners assured me that a good sawyer will easily cut out 180 to 200 square feet of planking with this instrument in the day, and thereby earn 2 francs. No other is used. I noted also a compass, and what is described as a sextant (apparently a dendrometer or kind of clinometer) in brass of Native manufacture. This instrument the Commissioner said had been used in its present form ever since Japan existed. A chart giving the following information most quaintly by colored proportional scales :—

I.

	chos.	chos.
Area of the whole empire, ...		38,563,716
viz.,		
Honshin, ...	22,846,603	
Shikoku, ...	1,837,344	
Kinshin, ...	4,158,464	
Okinawa, ...	244,026	
Hokkaido, ...	9,477,279	38,563,716

II.

Forest area exclusive of the island of Okinawa and Hokkaido—

	chos.
Government, ...	5,259,182
Private, ...	6,607,443

III.

Forest area in Honshin (main island)—

	chos.
Government, ...	4,526,803
Private, ...	5,466,218

IV.

Forest area in Shikoku—

	chos.
Government, ...	358,381
Private, ...	817,319

V.

Forest area in Kinshin—

	chos.
Government, ...	374,017
Private, ...	322,905

VI.

Forest per head—

	Tans
Whole Empire, ...	3·25
Honshin, ...	3·525
Shikoku, ...	4·4
Kinshin, ...	1·32
One "cho", ...	= 2·4567 acres.
One "tan", ...	= 0·24507 „

A chart showing the distribution of forests arbitrarily divided into five different regions represented from the sea-level upwards by the following species :—

1. *Ficus Wightiana*,
2. *Pinus Thunbergii*,
3. *Fagus sylvatica*,
4. *Abies Veitchii*,
5. *Pinus Cembra*,

bearing subsidiary charts as follows :—

I.—Paintings of each of the above five trees, with leaves, flower and fruit of each on a larger scale.

II.—An ingenious table of maximum and minimum elevations of each of these five regions in each of the 44 provinces of the empire; thus showing at a glance the correspondence between the variations in altitude and latitude.

III.—A small scale map of the empire showing demarcated and undemarcated areas.

IV.—A horizontal projection of the main chart.

V.—A list of 199 trees as distributed in the above five regions, and a list of 117 shrubs found in the empire, with vernacular and botanical names.

A fine collection of fruits in spirits, seeds in test-tubes, &c., "canned" mushrooms, edible fungi, &c., vegetable wax camphor

and similar products in stoppered glass jars, cigarettes of *Sterculia platanifolia*, and so forth; a very complete collection, and neatly got up.

A good class of turnery, cooperage, &c., consisting of barrels, milk pails, wash tubs, &c., of the familiar European patterns, the barrels hooped with platted bamboos and withes, the perfect accuracy of the jointing being specially noteworthy; also solid wooden bowls ranging from 3 inches to 3 feet diameter, spoons, forks, ladles, &c., from the most barbarous shapes to the well-known "fiddle" pattern, tooth-brushes similar to those used by the natives in India, but superior in finish, with "tongue scraper" combined. Tooth-picks in neat bundles with paper wrappers, lucifer matches made in perfect imitation of the cheap Swedish kinds with blue boxes, red labels, dirty green wrapper complete, the label even bearing the inscription "Sakerhets Tandstickor." Models of charcoal kilns, one kucha in earth, the other pucka built of stone, and some twenty specimens of excellent charcoal of various woods.

The collection of fibres is small, but well selected. The fibres are shown raw, and worked up into foot-mats, coarse sacking, rope, and fuses, the two most important seem to be *Sterculia platanifolia* and a *Tilia*.

Bamboo and its uses are well shown, specimens of some 30 or 40 species are exhibited, the manufactured articles are similar to those of India, and show that great attention is paid to the minutest details.

A splendid collection of 270 kinds of timber—the specimens are in slabs cut uniformly 3 inches thick by 3 feet long through the centre of the tree, the bark being left on the edges; each specimen is accompanied by a description giving—

(1). Native and botanical name,
(2). Description of tree, habitat, &c.,
(3). Average height and girth at 50 years and at maturity,
(4). Method of propagation,
(5). Quality and description of wood,
(6). Uses of timber,

and in most cases by dried specimens of leaf, flower and fruit, and in others the same hand-painted, all in glazed frames.

Also a fragmentary collection of some twenty specimens, exhibited by a private individual, of tablets of various woods framed with branch-wood to show bark, and hand-painted showing the leaf flower and fruit of parent tree.

The Japanese as a rule cube their timber immediately it is felled, and float it at once to the sea, where it is stored in tanks filled with equal parts of salt and fresh water until required for use. This is said to preserve the timber from decaying.

The Commissioner assured me however, that the specimens exhibited were cut from the green tree, and exported without

undergoing any special seasoning process. Of the result there can be no two opinions, the admirable condition of the specimens is most striking, scarcely a crack being visible in the whole 270.

There is also a most interesting collection of 40 specimens of trees ranging from 3 feet to 15 feet in height, with root and branches complete, and between four and five years of age. These are all of various European kinds grown from imported seed, and illustrate the progress made in acclimatization work.

Thirty framed photographs are also shown to illustrate the methods employed to arrest the denudation of bare hill sides by means of fascine works, pucka dams, &c., &c. Though unfortunately the photographs are so hung as to prevent a close examination, yet enough can be seen to show that apparently no expense or labor is spared in this department.

I have been obliged to pass over a large number of exhibits out of regard for your space, but believe I have enumerated the most interesting and noteworthy. I feel sure that you and all your readers will agree with me, from even this meagre account, that Japan has shown a spirit of enterprize worthy of our admiration. Personally I have been much struck by the clever way in which the Japanese have adopted and adapted all and just those ideas of European scientific forestry best suited to their climate and conditions.

FURLOUGH.

THE GOVERNOR OF MADRAS ON FOREST CONSERVANCY.

"THE third and the last thing we respectfully venture to invite your Excellency's attention to, is the hardship caused to the ryots and inhabitants of the up Ghaut Taluq by the introduction of forest conservancy. The ways in which this system has affected our condition are too many to be fully enumerated now. It has thoroughly affected our live stock, which mainly constitutes our wealth. Our cattle have always been used to free and unrestrained grazing in the forest. Now that they are prohibited from entering the reserves, this mere restraint has tended to the death of large numbers. Until they become inured to the system of being tied up at one place, and fed there, even supposing that it were possible to do so, we must be losing our cattle in large numbers. The next difficulty is that of preventing these irrational beings from trespassing on the reserves. This, in fact, takes away a good deal of our time. The third difficulty is how to get fodder for these at home, and so on. It is a known thing that we generally take our meals, not in dishes and cups, but on leaves. In this country we depended on the leaves in the forests, and now this thing of our daily wants having been reserved, every soul is in a sad plight, when he goes to his meals. He does not see where to find leaves. It is no exaggeration to say that leaves for taking meals are

here being brought from the forests in such large quantities every day, that many poor old men and women, too old to do any hard work, used to go to forests to fetch some leaves for sale, and could thus pull on with their leaves. Now the conservancy system has deprived them of their means of livelihood, and the bulk of the poor inhabitants of one of their daily necessaries of life. We have laid some of our grievances, even of our pastoral and cottage life, so to speak, and trust that Your Excellency will graciously take these things into benign consideration and remedy the evil. We respectfully beg to conclude with an expression of our heartfelt thanks to your Excellency for the opportunity thus given us of submitting the sorrows of our heart directly to our Sovereign, as your Excellency is."

"Lastly, you speak about the forests. Well, gentlemen, I am sure the more intelligent of you do not imagine that all the dreadful things you speak of, are going to happen. Certain pieces of forest or jungle are in course of being turned into "Reserved Forest," after full inquiry into and safe-guarding of all your rights. The simple fact of the matter is that things had come to such a pass, that if Government had not stepped in, and said that certain forest must be looked after, and managed on a reasonable system, you would very soon have had no leaves, and no wood, and no grass. Things were going to rack and ruin, as fast as they could. I have been travelling for the last week or two, chiefly with a view to examine the forests, and to see what is being done about them, and I can assure you that I do not think we have stepped in an hour too soon. Utter destruction would very soon have stared all cattle owners in the face, and many other evil consequences would have arisen. Then, and very properly you would have turned on the Government, and asked why such wanton and wicked waste was permitted? To that question the Government could have given no answer. You will have plenty of wood land left to you where you can hack and hew to your heart's content, but the time will come (when unreserved forest has disappeared) that you will bless those who saved you from yourselves, and be uncommonly glad that the Government reserved certain portions of the forest from the general destruction to give you and your children fuel, and leaves and grass for your cattle, and a hundred other good things which, if we had allowed events to take their own course, would have been lost irretrievably."

The above extracts from an address to Mr. Grant Duff at Palmavér and his reply, shows the great interest taken by the Governor of Madras in forest work in that Presidency. The complaints made by the people of Palmavér, in the North Arcot District, were mostly due to a misapprehension of facts. The proposed Reserved Forests are still under settlement, and a most careful enquiry into rights, especially rights of grazing, is in progress, though even with a vast amount of proclamation it is difficult to persuade people who have claims, to make them properly and get them properly enquired into.

The question of leaves for plates referred to is one which should properly have been made to the Collector, who will probably settle the matter himself. The leaves are those of the

'Moduga,' the *Butea frondosa*, and their collection is certainly not likely to do much harm even in the most strictly guarded reserves.

It is much to be regretted, in the interests of Forest Conservancy, that the Collector, Mr. A. J. Stuart, who has done so much for forestry, and taken such interest in the work of the Department, is shortly to retire. There are not many Civil officers in Madras who have done so much for forestry as Mr. Stuart, and all we can say is that we hope his successor will be as good a forester as himself.

The Governor has lately visited several of the forests and plantations in the Cuddapah and North Arcot Districts, and has, we understand, been much interested by what he saw. He has seen the Red Sanders in its native wilds and in plantation, the evergreen forests of the Pallampet valley, the rocky but still fairly well clad slopes of Horsleykonda, and the scrub jungles of the plateau of Madanapalle and Palmavér.

He has now gone to see the Forest Reserves of the Pulney hills, and in September intends to visit the teak forests of the Anamalais.

BEES IN THE PUNJAB.

At the Calcutta International Exhibition were exhibited specimens of the bees and honey of several districts in the Punjab, and the original district reports which accompanied the specimens have now been published by the Revenue and Agriculture Department of the Government of India. The bees exhibited were from Murree, Rawalpindi, Hazara, Multan and Bashahr. In Murree and Hazara bee keeping is largely practised by native villagers. The hive is a hollow cylinder of clay, varying from 8 to 20 inches in diameter, and proportionate in length to the thickness of the wall of the house in which the hive is to be kept. The hive is built into the wall, the outer end being closed up with exception of a small entrance hole, and the inner end being covered with a screen of clay and matting or board. The hive is prepared in April, and either a swarm is procured and shut up in it for a few days, or else the mouth is smeared with honey, *gúrh*, or *bhang*, by which a wild swarm is soon attracted. The comb is constructed in the course of 15 or 20 days, and in it the young bees are reared, becoming full grown in May, when they swarm off elsewhere, leaving the old bees in possession. These now begin to fill the combs with honey, a process which is completed by October or November, and finally, the honey is removed after opening the inner end of the hive and stupefying the bees with the smoke of burning cloth or tobacco or cowdung. The quantity of honey produced varies from 2 to 12 seers per hive, and the honey is prepared for sale by straining the mass of

combs through a cloth. Of the two kinds of bees the larger only are domesticated, except in and near Rawalpindi, where the small bee is kept in the same manner as the larger bee of Murree and Hazara. The small bees build their combs on rocks or trees, and are said to fill them both in the spring and in the autumn, producing young twice a year. In Multan only the small bees are found, but the District Report seems to show that these are of two kinds, one with stings and one stingless, and that the bees of both kinds produce honey. During the cold weather they hibernate in fissures of walls and trees, but for the rest of the year they work actively, filling their combs with honey both in spring and autumn. They are not domesticated or hived in any way, a fact due chiefly to the presence of numerous enemies in the shape of hornets, flycatchers and such like; and the bees seldom remain long in one place.

In the Bashahr hills near Simla five species of bees are known, of which only the *Yung* species is domesticated. The Yung resembles the common English bee, is easily hived and tamed, and produces a large return in honey and wax. It is only found in temperate climates and where the rainfall is sufficient, and its range is between 5,000 and 12,000 feet elevation. In the upper valleys of the Sutlej the Yung bees are domesticated in specially built houses, in the walls of which are numerous recesses, each with a small entrance hole on the outside. These contain the swarms, which are either attracted to the hive by rubbing it with a sweet paste, or are caught in boxes elsewhere and then brought in. Each house or collection of hives is placed under a man's charge, whose duties are to prevent excessive swarming, to keep the apiary well stocked, and to guard it from the attacks of bears, martens, hornets, wasps, and caterpillars. The honey is extracted in October after smoking out the bees, enough being left in the hives to support the bees during the winter. The yield of honey from an apiary often amounts to 50 pucka maunds, and large quantities are used in making an intoxicating liquor much consumed by the people of the neighbourhood. The other varieties of bees are not domesticated, but their honey is taken whenever found, and that of the Bungras or Humble bee is said to be of very superior quality. Bee keeping is largely practised also in Kashmir, and in some parts, especially in Lar, every native has several hives in his house.

A PIONEER OF FORESTRY IN MADRAS.

SIR,—Can any of your readers throw any light on the statement made by Sir George Birdwood in his note on the Indian exhibits at the Edinburgh Forestry Exhibition, which was as follows :—

"Before 1848 no check whatever had been imposed in India on the reckless clearing of the primeval forests for cultivation, and no heed was taken of the effect such clearing, particularly on the slopes of hills, would have on the rainfall. In 1848 Major-General Frederick Conyers Cotton, C.S.I., then a Captain in the Madras Engineers, urged on the Madras Government the necessity for taking some immediate steps to preserve the forests bordering on Coimbatore and Cochin from further denudation by the reckless wastefulness of the native contractors who farmed the forests for the supply of teak-wood for the Bombay dockyard. On his recommendation Colonel (then Lieutenant) Michael, C S I., who had had opportunities of observing forest conservancy on the continent of Europe, and who, as an accomplished *Shikari*, had a wide practical acquaintance with the forests of Southern India, was appointed to give effect to General Cotton's proposals. Colonel Michael organised an establishment, opened out roads and timber slips down the mountain passes, and soon scored a financial success. His efforts in providing efficient conservancy were far more important. It became at once apparent that it was better in the interests of the State to preserve the magnificent natural forests of the Presidency than to raise an immediate revenue from them; and the first step taken in this view was to lease an extensive teak tract from the Zemindar of Colangode, and to buy up all his minor contracts with timber merchants. The whole of the Southern forests in the Madras Presidency, down to Cochin and Travancore, were thus placed, and have ever since remained, under strict conservancy. A system of clearing belts of brushwood to preserve the young saplings from fire was also introduced, the hill tribes being employed in the work; and in this way the destruction of the principal forests of Southern India was most opportunely averted.

"Within a few years the advantages of these measures, and the great success of Colonel Michael's work, were so clearly seen, that the Court of Directors, who had just then been so strongly impressed by the report of the British Association, sanctioned the extension of General Cotton's scheme to the remaining forests in the Madras Presidency and, in short, inaugurated the organization of the regular forest department, not only in Southern India, but for the whole Indian peninsula and British Burmah. About the same time Colonel Michael, whose health had been undermined by seven years of incessant exposure to the dangers of forest life, when little was known about healthy or unhealthy seasons in the jungles, was forced to retire from his appointment, the work of which was taken up by Deputy Surgeon-General Hugh Cleghorn, M.D., as the first regularly constituted Conservator of Forests in the Madras Presidency."

It is curious that before this we have heard very little of the claims of Colonel Michael to be considered as the pioneer of forest work in Madras, and to 'have provided for an efficient conservancy.' So far as I have ever heard, Colonel Michael merely had a sort of roving commission to cut timber for the Public Works Department in the Anamali forests, and this he did, combining the work of felling trees with a considerable amount of 'shikar.' Perhaps, however, some of your readers can throw some light on the subject and tell us what the gallant

Colonel, who afterwards, when he got tired of shikar and the Public Works Department, held various employments under the Government of Madras, and especially that of Military Secretary, really did for forest conservancy. It sounds like a joke to find Sir George Birdwood saying that owing to Colonel Michael's energy 'the whole of the Southern forests of Madras were placed and *have ever since remained* under strict conservancy.' It looks very much as if a little mutual admiration society had been started at home, and it will be very interesting to ascertain facts.

ENQUIRER.

ENSILAGE.*

TO THE EDITOR, "INDIAN FORESTER."

SIR,—In November last I pitted some common grass in a pit made as follows :—

All of wood with false bottom and false sides, the space (8 inches) between the two bottoms was filled with saw dust, as were also the spaces (4 inches) between the two wallings. The box measured inside 4′ × 4′, and depth 6 feet. This was nearly filled with grass, and a weight of some 25 cwt. was put on top. The mass of grass sank very gradually, but continued sinking for a very long time.

The pit was opened on the 27th March. The top from 6 to 8 inches was bad, and the sides for about 1 inch.

The rest of the ensilage was in perfect condition, and was readily eaten by bullocks and ponies. I think this experiment will set at rest the question as to whether ensilage will succeed in this country or not.

TAVOY, BRITISH BURMA,
28th March, 1884.

CHARLES W. PALMER.

P.S.—I forgot to say that the pit was built under my house, and was therefore perfectly protected from all rain.

A VERY successful experiment in practical ensilage was recently made at Allahabad, by Major General Macpherson. The rank vegetation growing on a plot of grass land, about an acre in area, was cut down in August 1883, and packed in a pit dug in the ground 20 feet long, 10 feet wide and 8 feet deep. Continuous and heavy rain fell during the operation, and most of the grass was dripping with moisture when put into the pit. The

* We must apologise for the delay which has occurred in publishing this letter, which is entirely due to an oversight on our part.—[ED.]

grass was well and carefully trodden down, and upon the top was piled the excavated earth. The surface of the earth was sloped off, plastered with cowdung, and finally sown with dúb grass, a process which effectually prevented the surface from cracking. The silo constructed was left untouched for seven months. In March 1884 it was opened, the contents being found to be in excellent preservation. About 70 maunds of green grass had been originally put in, and about the same weight of ensilage was taken out. The ensilage was eagerly devoured by cattle, mules, sheep and horses. Its smell was at first disagreeably strong, but exposure to the air soon reduced the pungency; and the ensilage acquired the colour and smell of ordinary hay. The results of the experiment are very instructive, and conclusively prove not only that ensilage is valuable in itself, but also that it is easily applicable to the agricultural conditions of this country, as affording an effectual and simple means for utilising as nutritive fodder the abundant vegetation of the monsoon, which hitherto has been entirely wasted.

FOREST LAW—SEC. 67 OF THE FOREST ACT.

WILL any one tell me if the composition demanded by a Forest Officer, empowered by the Local Government, under Section 67 of the Forest Act, for a forest offence, and paid by the offender, can be declared too high by the Commissioner of the Division (on an appeal to him by the offender) and be ordered to be refunded?

SCARABEE.

Note.—In order to see whether there is an appeal or not, we must look to the Criminal Procedure Code (Act X. of 1882), which governs all criminal cases, whether under the general or special Criminal Law. Now by section 407 an appeal lies from a conviction on a trial, but not otherwise, unless it is expressly so provided. The Commissioner (Sessions Judge) has no jurisdiction to hear an appeal from an order of composition, under section 67 of the Forest Act, for clearly there is no trial and conviction; the accused if he thought himself innocent, or guilty of an offence too slight for the payment demanded, could refuse to pay and insist on a trial. But perhaps the Sessions Judge thought he could act under section 435, calling for the record of the "proceeding before an inferior Criminal Court * * * in his jurisdiction." We think if the Forest Officer acting under section 67, could be held to be a Criminal Court holding a criminal proceeding, the section would apply, and the Sessions Judge could "satisfy himself of the correctness, legality or propriety" of the order: but clearly the Forest Officer specially empowered is not a "Criminal Court," nor

is the agreement to pay the compensation a "proceeding" (see also definition in section 4, Criminal Procedure Code (clause *d*)) in a Criminal Court. Clearly, then the Sessions Judge acted illegally. The only way in which interference could be effected, would be by the superior of the Forest Officer, the Local Government, or the Commissioner (if he is the official superior of the Forest Officer), acting in an *executive* capacity, in the course of the usual official supervision.

DISCOVERY OF COPROLITES AT MUSSOORIE.

Rev. J. Parsons found on his estate, Midlands, at Mussoorie, peculiarly shaped nodules from ¼- to ⅜-inch diameter. Many of them were spherical, but others were oval or lenticular, or of peculiar shape indicating some organic structure. Inside, the nodules were dark grey or black, and they were very hard, so that in some cases it was almost difficult to distinguish them from the black chert with which they were associated.

The specific gravity was found to be 2·910. Chemical analysis showed the nodules to consist of calcium phosphate with silica, clay and black organic matter or free carbon. This analysis and the shape of the nodules leave now no doubt that they are true coprolites.

The horizon in which the coprolites occur is the base of the chertbanks in immediate contact with the uppermost layers of the great limestone formation of Mussoorie. For description of the strata, see March Number of the "Indian Forester," 1884, page 114. The map which accompanies the description shows that chertbanks in contact with the limestone occur over an area of 2 miles length at Mussoorie, and again 3 miles further east near Mosrana. The coprolite bed promises, therefore, to be of considerable extent. For the present the bed has been traced at three places besides Midlands, namely, on Castle hill, at the Club, and near the 6th mile on the Rajpur-Landour road. The latter point is one mile from Midlands.

With the coprolites one inch thickness of a porous rock was found, which consists also principally of calcium phosphate.

No traces of fish scales or teeth have as yet been detected. It is, however, quite reasonable to expect that bones of the reptiles will be found from which the coprolites must have originated. Apart from this prospect the discovery of the coprolites themselves, and of the matrix of calcium phosphates, is in itself of scientific importance. It affords a clear proof of animal life in strata which have up to the present yielded no fossils at all, or only of such meagre description that the true age of the strata has never been determined.

The Superintendent of the Geological Survey has been informed of the discovery.

Analysis of phosphorite from 9 inches thickness of the bed near the Cricket ground, Castle Hill estate, Mussoorie.

	Per cent.
Water, ...	1·5
Insoluble in acids, chiefly silica, ...	10·9
Ammonia precipitate, nearly pure phosphate of lime,	78·5
Calcium carbonate, ...	9·2
Magnesium carbonate, ...	0·2
Alumina, ...	Trace.
Total, ...	100·3

As the ammonia precipitate contains only small quantities of admixture, we may safely assume that 75 per cent., or ¾ths of the mineral, are phosphate, the rest being chiefly made up by calcium carbonate and silica. One square foot of the bed at this point yields 100 pounds of pure calcium phosphate in the phosphorite, besides what is contained in the coprolites, which are scattered in a layer of clay above the phosphorite band.

FORESTRY EXHIBITION, EDINBURGH.

We have received a circular, in German, signed by Dr. Brandis, and calling upon those who wish to contribute to the success of the Exhibition of Forestry at Edinburgh, to send in their exhibits before the 15th May, 1883.

The conditions under which objects may be sent for exhibition are known to our readers, but we do not remember having seen in any other notice so specific and complete an account of the objects which it is most desirable to send. No doubt the circulation of this list in Germany will do good, and induce many Foresters and forest instrument makers to send in objects which would not otherwise have been sent.

Dr. Brandis quotes the following from the "Allgemeine Forst und Jagd-Zeitung":—

The impetus which the exhibition will give to forestry will, it is hoped, lead to the founding of a school at Edinburgh. The foresters in charge of the extensive forests of private owners in Scotland have hitherto had only an empiric training. A young man, who wishes to become a forester, is placed at an early age under the Manager of an Estate, and at the end of his term of probation obtains or tries to obtain a position as Manager or Assistant Manager. The necessity of his receiving a scientific education is, however, now generally admitted; hence the desire for a school of forestry. The total area of Scotch forests is only 750,000 acres, but the heather and waste-lands are very extensive, and every year considerable areas are planted up. The State has no forests in Scotland, and the school, if ever it is established, would in all probability be a private institution similar to that of Weisswasser in Bohemia.

BAMBOO SEED.

TO THE EDITOR, "INDIAN FORESTER."

DEAR SIR,—We have had a number of applications lately for *bamboo seed;** do you happen to know of any place where the bamboo has seeded lately? I would like to procure a good quantity both to meet members' applications and to exchange for timber and other seeds from other countries.

I do not find much information on the subject, but understand that bamboo raised from seed made better growth than those propagated in the usual way. Any information on this subject either for our Proceedings, or in your own Journal, would be very interesting.

RICHARD BLECHYNDEN, JR.,
Deputy Secretary,
Indian Agricultural and Horticultural Society, Calcutta.

A NARROW ESCAPE.

THE following extract from a letter from Dr. Briscoe, the Civil Surgeon, Kuch Behar, dated 15th August, relates to a narrow escape from a tiger by his son, a Tea Planter, in the Darrang District, Assam :—

"I received a letter from Tom this afternoon, in which he states he had a narrow escape from a tiger a few evenings previous. He was out dining with some others at Campbell's the forest officer's place, and on his return home about midnight, the road lay through some jungle grass, and as he was passing through it, a tiger sprang on his horse. Fortunately he was going at a good pace, and the horse was a great strong beast, which he had lately got up from Calcutta, so the tiger missed his spring, and only got on the horse's flank, which he clawed and bit very nastily. Tom hit the brute over the head with his whip, and shouted as loud as he could, which caused the beast to let go, and Tom managed to ride the horse home; the animal was still in great pain when he wrote, and he has doubts of its ever getting over it. He says it was a moonlight night, and he saw the beast distinctly, and that it was not pleasant, to see the tiger's ugly face alongside his leg. The next day he went after the tiger, but of course did not get a glimpse of him."

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* *Bambusa arundinacea* only seeds every 30 or 40 years. *Dendrocalamus strictus* seeds partially almost every year in the Dehra Dún and Saháranpur Districts, and we can generally supply seed in April.

A very full account of this bamboo, by Colonel Doveton, was given in the November Number of Vol. IX., "Indian Forester." If any of our readers will kindly note in our pages whether any species of bamboo is blossoming now in any part of India, the information will be very acceptable.—[ED.].

JJ. Official Paper.

NOTES ON THE NATURAL HISTORY OF THE LOCUST —*ACRIDIUM PEREGRINUM.*

In the Konkan the locusts coupled in great numbers between the 15th May and the 15th June, 1883, and died off naturally immediately after the eggs had been deposited. The eggs are deposited mostly in flat and gently sloping warkas land of soft friable soil; rocky and sandy soil being avoided, and land which has been ploughed up and the lee-side of the balks, where the soil has accumulated, are mostly selected. The eggs are piled in a small cylindrical hole, parallel to its sides, and are attached to one another by some cohesive siccable substance. Filling the mouth of the hole is a plug, consisting of a soft fibrous substance, and below it the eggs arranged, as described, averaging 70 in each hole. The holes are from 1·5 to 2 inches in depth, and in a good locality four might be found in a span. They are not easily visible, but when one is found others are generally near it. Brushing off the loose dust and digging here and there facilitates search.

The eggs themselves are of a dirty ochre colour, in length ·2 to ·3, and in diameter ·05 to ·08 of an inch, rounded in section, with a slight curve, and tapering very slightly towards the rounded ends.

Fig. 1 shows an egg of ·2 length and ·05 diameter, dimensions magnified five times. When fresh, the contents of the eggs are of a dirty orange colour, liquid but slightly viscous, with a somewhat acrid taste. The envelope apparently consists of two layers, the outer one coloured and tough, and the inner one white and fragile. When broken the eggs give off an odour like a broken root. As the eggs approach maturity, they assume a distinctly greenish hue, and the young locust bursts the shell down the middle on issuing into life.

I experimented on some eggs by placing them in damp and very damp soil, but the water did not affect the hatching.

The young locusts appeared in myriads in my district (Chiplun Taluka) between the 1st and 20th August, so that the period the eggs required to hatch was a little more than 2 months—say 70 days.

The young locusts vary somewhat in colour, most being a dullish light green, some light green but hardly verdant, and a

few almost white and only tinged with green. They, a few minutes after hatching, are strong enough to jump, and are as perfect insects as at any time up to the winged stage. The antennæ are darksome and short, whilst on the thigh-cases small black spots, and on the upper side of the abdomen a faint black line, are just visible. The black line and the black spots are, I consider, the diagnostic marks, although I see that the Secretary and Curator of the Victoria and Albert Museum in his No. 569 of 1883 talks of a dark streak below the eye as existing from the earliest stage; I did not observe it until the initiatory winged stage. Their length is about ·4 of an inch.

The young locusts generally cast their slough for the first time about 15 days after birth, and in their new skin, the black line and spots become darker and the green colour of a deeper hue. They now leave the grass land and seek the shelter of the crops, and are in length ·8 of an inch.

After another interval of 15 days they again cast their slough and enter on the 3rd stage. In this the black line becomes very intense, as also do the spots which lengthen and form the so-called Koranic Verses—they do show a certain similitude to some letters of the Arabic alphabet ن ل. They are now 1·2 of an inch in length.

They enter the 4th stage by casting their slough after another 15 days, and assume, including the antennæ, a yellow colour, which towards the end of the stage becomes pinkish-grey. The black line and the Koranic Verses are now very intense in colour, and the insect attains the length of 1·6 of an inch.

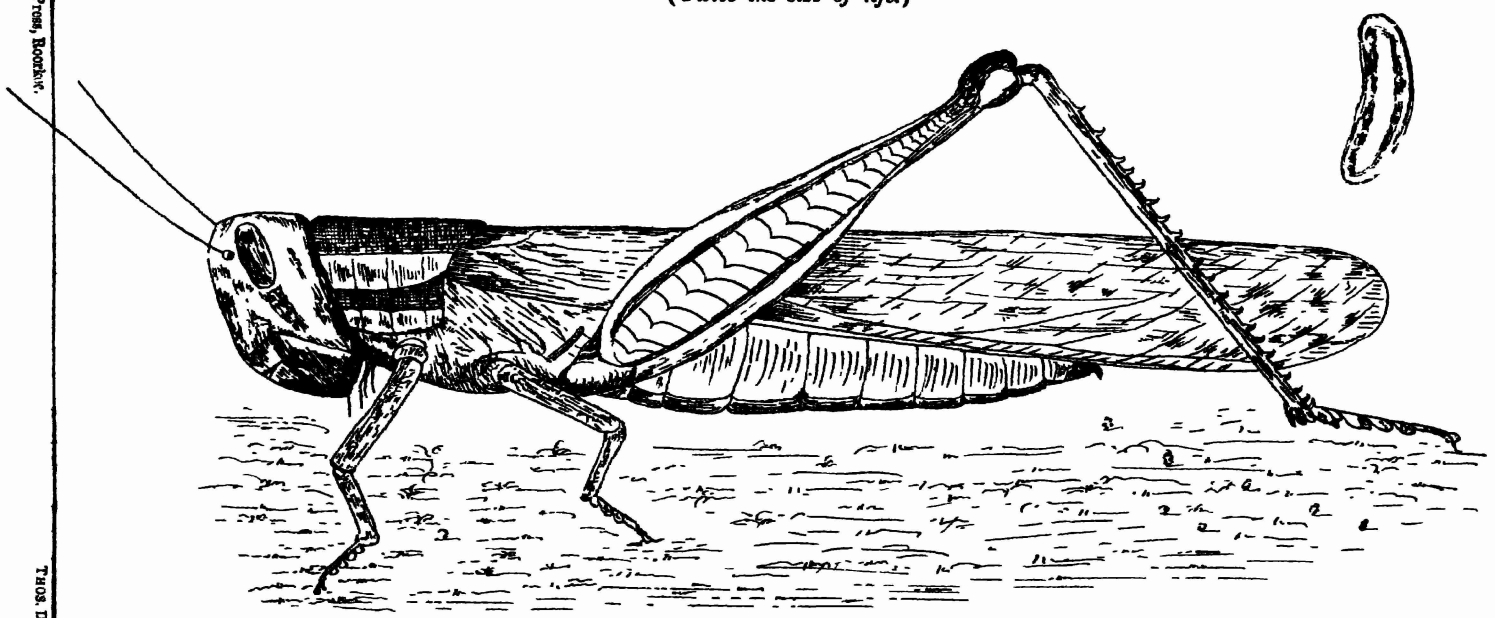
A great transformation is witnessed on entry into the 5th stage after 15 more days. The female is now 2 inches long, whilst the male is somewhat less. The colour of the head, prothorox and abdomen is a grey or drab, speckled on the prothorox and darker along the upper side of the abdomen. The ringed antennæ are a deep yellow, the eyes chesnut and striated, whilst for the first time appears an oblong mark under each eye, indigo green in colour, and bordered on each side by yellow. The Arabic letters have now disappeared, whilst the spots on the thigh-cases are obsolescent. The young wings, too, now first appear. At first very small, they grow during the period of this stage—20 days. The contents of the wing-sprouts is at first liquid, and the young wings may be seen forming within the semi-transparency. When they are fully formed the insect is of a dark brownish grey colour, whilst on the prothorox and elsewhere may be distinguished the colouring of the next stage.

In its 6th and perfect stage, the insect presents a brilliant appearance. The female is now 3 inches and the male 2½ inches in whole length from head to tips of wings, which overlap the abdomen by ·5 of an inch, and are rounded. On casting the slough the wings dry and unfold, and the body of the insect, at first soft and moist, gradually hardens in the sun. The antennæ

FEMALE PERFECT INSECT—ACRIDIUM PEREGRINUM.

(*Twice the size of life.*)

Fig. 1.



Litho. T. C. Press, Roorkee.

THOS. D. BONA, Supdt.

are ·8 inch in length, and of a bright yellow colour, the head is a brownish yellow, and the eyes, finely striated, are of a deep chesnut. The prothorox is alternately banded with a bright yellow and a rich brown, parallelwise to the body, and the legs are of an ochreish hue. Along the upper rim of the femur runs a deep brown stripe, and the knee-caps are of the same colour. The tibia, tarsus, and foot are a bright ochre, and the first is armed with 8 black-tipped spurs on the outside and 11 on the inside, while there are a pair of spurs on each side of the ankle-joint and on each side of the foot. The outer wings or wing-cases have the colours on the prothorox extended to them, and on the back they form a flat surface, tapering to the extremity. They are strongly veined and finely reticulated, and towards the extremities are irregularly brown marked. The inner wings which are expansive are hardly coloured. The abdomen is a light-brown, darker along the ridge, and in the female there are four spiky processes at its extremity, the upper pair curling up and the lower pair downwards. In the male the lower pair is replaced by one spiky process larger and stronger.

The locust now packs with its kindred, and they form the swarms which ravage the country. After a month or so, they assume a red tinge, which gradually deepens, and continues until their death, which takes place after the sexual function has been performed in May–June. The proportion of males to females appeared to me about 1 in 6.

The whole life of the insect, including the egg-period, is exactly one year.

The accompanying sketch is that of a full-grown female insect twice the size of life.

H. F. Hatch.

III. Notes, Queries and Extracts.

Re-afforesting of Ireland.—Dr. Lyons, the junior member for the City of Dublin, sets a useful example to his fellow Irish members by the ardour with which he has thrown himself into the very practical subject of the re-afforesting of Ireland. Countries pass through several stages in the matter of forests. When a new region is being settled trees are treated as enemies. Not even the law of beasts of chase is granted to them. The sole thought is how soonest and most completely to destroy them root and branch. At a later period their value begins to be appreciated for fuel and building. Their fate is then harder than before. A colonist leaves them intact on the hills and wastes; lumberers and timber merchants pursue them relentlessly to their last refuges, and at length a day comes when the wood, hated or coveted, has all disappeared. Foreign timber is naturally dearer than home-grown by the cost of transit. Abroad the same ravaging agencies have been at work; and the foreign supply tends to become as scanty as the native. At this point a counter fashion often grows up, and timber is planted as an article of commerce to replace the indigenous forest. Towards the commencement of the present century many landowners in this island planted on a vast scale for profit. In Scotland Chief Commissioner Adam set the example, and Sir Walter Scott popularized it by his pre-eminent literary and social influence. A consequence has been that both in Scotland and in England woodlands continue to abound, though even here, in Sir John Lubbock's opinion, not at all sufficiently. In Ireland the character of the cultivation and the demand for land wrought havoc with the ancient forests, to which the huge deposits in the bogs testify. When more recently the tenure was occasionally modified, and some great proprietors looked to pastures and grazings for their returns, sheep and oxen proved as ruinous to the interests of timber as peasant farmers. Only in a few scattered instances was the improving and mercantile instinct among Irish landlords turned in the direction of new plantations for profit. There is, however, a third stage in the national views on forests; and some Irishmen, as some Spaniards and Italians, and many Germans and Frenchmen, have at last reached it. Observant men have discovered that forests are something better than obstructions to farming, or even than the raw material of window frames and railway sleepers. Where they have never

been known the land is found to be a desert; where they were and no longer are, or where they are ceasing to be, evidence exists that the climate has been changing for the worse and the soil been losing its richness. In Spain and Italy since the mountains have been denuded the streams have been less fertilizing in summer and more addicted to mischievous floods during the rest of the year. The extremes of cold and heat have been more violent. The productiveness of the ground has diminished. Dr. Lyons, Mr. Mitchell Henry, and other patriotic Irishmen, have noticed similar results in Ireland; and they trace them to the same cause. Re-afforesting is the latest panacea for Irish misfortunes; and it has more to recommend it than most of the other nostrums which have been proposed.

At the invitation of Dr. Lyons, though at his own expense, Mr. D. Howitz. who holds the office of Forest Conservator in Denmark, has been examining the resources and the need of Ireland for forest cultivation. He has surveyed its mountain ranges, its moors, its lakes, and its rivers. His experiences and conclusions he has embodied in a report to Dr. Lyons, which has just been published as a Parliamentary Paper. His deliberate judgment agrees with the surmises which had already been formed. Swamps and morasses are created in Ireland from the want of trees to drink up the superfluous moisture. Irish rivers inundate the districts they traverse because there are no forests on the mountain tops to arrest and retain the autumn and spring rains. In summer there is a dearth of water because the trees are gone which would have served, each, as a reservoir. A tree is advantageous in a double way; it is like a camel in its power of imbibing an enormous quantity when water is abundant or superabundant; like a camel it keeps the store for a time of scarcity. Irish agriculture, by its system of straight drains, which Mr. Howitz entirely disapproves, has acted as if water were poison instead of nutriment. In the past by felling the mountain woods, and in the present by planting no successors, it has done worse by tapping the supply at its source. Irish fruitfulness, he warns the nation, is gradually being drained and washed away into the lakes and seas; and no preparation has been made to replenish it. The folly is, in his estimation, the more inexcusable that the island presents the especial conditions for rendering forestry easy and beneficial. On the hills the soil is still able to feed all the trees which can be put into it. Out of the twenty million acres in Ireland he reports there are at least five millions for the most part waste, which might be planted with a reasonable certainty of profit. Irish wastes on the mountains and in the valleys are, he considers, of a different order of fertility altogether to the Landes, or the Pyrenean and Alpine slopes, on which re-afforesting is being conducted with indisputable gain. Ireland would, he is persuaded, grow valuable timber, instead of the commoner and cheaper kinds. A list

appended to his letter to Dr. Lyons enumerates 36 conifers, 38 deciduous and hardwood trees, and eight sorts of bushes, which could be grown to advantage. The varieties could be selected with regard to the readiest local uses for the wood. He has drawn up from personal inspection an elaborate scheme for planting a hundred thousand acres every year for the next 30. By the end of 30 years a plantation, he reckons, comes to full productive capacity, without respect to the previous incidental returns from brushwood and saplings. At 30 years of age he calculates that the cost per acre will have been at highest £20; the average annual profit at lowest he puts, at present prices, at a pound. Probably, as the demand for timber, of which England yearly imports two hundred and ninety million cubic feet, is rising, and the area of supply has been continually narrowing, the profit may be much larger. At present most of the five millions of waste pay not a penny of rent; the residue yields less than sixpence an acre. Mr. Howitz's business is to account for the alleged deterioration of Irish soil, and to explain how that propensity might be checked and the wilderness be utilized. He must be admitted to have executed his task very satisfactorily. How his plan is to be set going is a separate question, which the most skilful forester cannot settle. An Irishman's first and spontaneous assumption, when a means of enriching his country is suggested, is that the State ought to provide the capital. Mr. Howitz has accepted this doctrine from his Irish informants, and speaks of an advance of the necessary funds by the Government as if that were a thing determined. The one fund which could be employed for the purpose is the Tramways fund, which the House of Commons was good-humoured enough to vote in spite of financial protests. Many calls are being already made upon it, and it would hardly go far towards the fulfilment of the ambitious programme sketched by Mr. Howitz. But there are great Irish proprietors who might have the public spirit to make the experiment. On whatever scale the enterprise is tried, and however the expenditure may be arranged for, the re-afforesting ought at all events to be effected on a regular plan and principle. Mr. Howitz crowns his report by insisting that on all accounts a Forest Department will have to be established to control both the operations and the outlay.

Mr. Howitz is an enthusiast, as all pioneers in a good cause must be. He is inspired by his theme to pass an eulogium on the seclusion of the forests he exhorts Ireland to plant, the bracing purity of their future air, their freedom from formal restraint, the content to which they would shape the national mind. Certainly a delightful contrast is suggested in his report between the bare melancholy rocks, quagmires, heaths, and potato patches, which divide so much of modern Ireland among them, and a land of foliage and hanging woods. Eyes the most jealous of

encroachments on the indefeasible title of Irishmen to starve at home can scarcely spy out malice and covetousness in a design for reclaiming barren hill tops in a manner likely to benefit not more their capitalist owner than his cottar neighbours. In England, at any rate, where fewer susceptibilities have to be soothed, and the State need not be importuned for the requisite capital, it is strange that Sir John Lubbock's and Mr. Howitz's precepts should be slow in making converts. Throughout the country plenty of land exists unfitted for all cultivation except trees, and without a plantation upon it. Plantations in a region like England yield a rent, if not enormous, exempt from most of the caprices of climate, and gathered with no dependence on tenants and little on labourers. Of all sorts of landownership there is none with fewer vexations and with more exquisite enjoyment. But forestry is an art; and the fact has only been lately comprehended. Its inculcation would not have been necessary now had not Englishmen formerly imagined that they were all born with the knowledge, and been taught their error by sad experience. Tree cultivation requires an apprenticeship beyond farming, and as much as engineering. The planter plants for posterity more than for himself. His mistake, if he commit one, extends over 30 years, or more, and not over six months. His puny vegetable fabrics reproach their constructor's ignorance for a lifetime. Every man who plants a tree incurs a grave responsibility; but a sense of it should be a motive for correcting the ignorance which renders it burdensome, not for refusing the soil its rights.—*The Times.*

Protection of Wild Birds in India.—In a paper read before the East India Association, by Mr. Robert H. Elliot, on July 11th, occur the following remarks :—

Let me state the measures necessary for preserving the birds of India, and also for promoting their increase, in parts of the country where, from the absence of woods, but few birds at present exist. To attempt to frame a measure suited to the varying conditions that exist throughout our vast Eastern Empire, would entail so much discussion, and consequent delay, that the introduction of such an Act would probably be contemporaneous with the destruction of the last specimens of the bright-plumaged birds of India. It is obvious, then, that the only practicable course open is to instruct the subordinate governments to frame, and at once put in force, rules suitable to their own territories, as for instance, was done in the case of the early forest laws. As far as the people generally are concerned, there would be no objection to bird-preserving, for as we have seen in the case of the peasantry of Mysore, they are well aware of the value of birds as insect-eaters. After about a year from the date of the enforcement of preservative measures, the exportation of skins

and feathers should be prohibited, as this would most effectively aid in checking any attempt to evade the laws.

But to promote the increase of birds, and spread them throughout the length and breadth of the land, is not less important than to prevent their destruction, and in order to effect this, plantations should be formed on the waste lands of every village. Such plantations would at once shelter the birds, provide fuel (to the saving of the manure now used for that purpose), wood for building and agricultural purposes, shelter for grass and crops, promote the conservation of water, and effect a general amelioration of the climate. Let me now briefly allude to bird-preserving, from a revenue point of view.

On examining the return of exports and value of feathers and skins, we are at once struck with the fact that the Government has not only been so negligent of the agricultural interests of India as to sanction the destruction of vast numbers of valuable insect-eaters, but, in addition, has been so weak as to bestow on the exporters (I say exporters, as it is obvious that the bird-catchers get mere wages) of the feathers large sums of money which ought to have found their way into the Imperial Exchequer. The Government, as many of you are no doubt aware, preserves wild elephants, and derives from them a source of profit. On what principle, then, it may well be asked, has it given away a much more valuable product of our forests—bright plumaged birds? Had these been treated as State property—which they undoubtedly are—and had a close time been established, and a certain proportion of the birds been caught annually by the Government, comparatively speaking little harm would have resulted, and the State would have obtained an annual source of revenue. Now, of course, after the melancholy destruction that has taken place, even if the measures I have suggested were at once adopted, many years must elapse before it would be prudent to attempt to derive a revenue from the birds. But when they become very numerous (which they certainly will if plantations are formed as I propose), I see no reason why a revenue might not be derived from them. We have remarked on the destruction of bright-plumaged birds in other countries, and it is clear that as the work of extermination extends, the price of skins and feathers must much increase, so that it is almost certain that, at some future period, a small annual take of birds would yield to the State a considerable sum. To show what the Government has already thrown away or rather presented as a premium to the exporters, I may say that if the exports from the other ports at all correspond to those from Madras (and there is no reason to suppose that they do not), it would be a moderate statement to say that, within the last ten years alone, the State has sacrificed half a-million of pounds sterling.

We have now seen that the advantage of birds is undoubted, and that their preservation demands immediate attention. Nor

have I ever heard but one objection made to preserving, and that was founded on incorrect information. It was alleged by the objector that to stop the destruction of birds would be to diminish the means by which wild, or hill tribes exist. So far as I can discover, such tribes do not destroy bright-plumaged birds. They are generally caught by Bhelias—wandering gangs of vagabonds, who plunder whatever they can find, and often make bird-catching a shield to other and more objectionable designs. Such vagabonds existed before the trade in feathers arose; they will equally continue to do so after its suppression, or after they themselves have abolished the trade by exterminating (which they assuredly will do if unchecked) the bright-plumaged birds of India.

Finally, let me remark on the need for establishing a close-time for the protection of game-birds. Every civilized Government preserves them, with the exception of that of India, which with two unimportant exceptions, allows them to be destroyed in any way, and at any season of the year. To act thus, is, of course, simply to extinguish a valuable source of food. The almost absolute extermination of game-birds (which live largely on insects, it may be observed) has already been accomplished in many parts of India. As to the rapidity of this extermination, I can myself bear witness, as Pea-Fowl, Jungle-Fowl, Spur-Fowl and the Imperial Pigeon, have been almost exterminated along the Western districts of Mysore. When last in India, I saw during a three months, visit one specimen of the Imperial Pigeon, which I regarded as a curiosity. The shrill call of the Jungle-Cock, once such a familiar sound, is no longer to be heard, and the extermination of this bird has been accomplished with a completeness I could never have credited had I not had ample opportunities of observing the fact. Towards the close of last and the beginning of this year, I drove through upwards of one hundred miles of woodland without seeing a single specimen, though I may mention that one was seen by my servant. As regards Pea-Fowl, from inquiries I made from the natives, not a specimen is supposed to exist in the neighbourhood of my plantations and for many miles around. I can only regard it a folly and a crime thus to permit the extermination of game-birds throughout the land. Had a close-time been established they would have yielded annually-increasing supplies of food, and, in the case of some of them, valuable feathers. But I have probably said enough to show that game-birds, as well as birds sought solely for their plumage, ought to be placed under the protection of the State.

Prompt attention is needed in order to extend throughout the length and breadth of India those woods which are necessary for the use of man, and birds, and the amelioration of the climate. Not less attention is required to preserve and promote the increase of those birds which so largely aid in

preventing an injurious increase of insect-life. Let us, then, do what we can to represent the cause of nature, and endeavour, on behalf of the beautiful and useful wild birds of India, to bring about a measure for the restoration, and preservation, of that balance of nature which has been, and is now being, so grievously injured by the negligence of the Indian Government.—*Pioneer.*

TIMBER FOR TEA BOXES IN CHINA.—The *Ceylon Government Gazette* contains further Consular Reports on the timber used in different districts of China for tea boxes. Mr. J. P. Hughes, of Shanghai, stated :—

The tea chests made at Shanghai are comparatively very few in number, the great bulk of the tea being packed in chests made in the interior. The wood generally used in Shanghai is a sort of pine known as "Shanmu," probably the *Cunninghamia sinensis.* It is chiefly imported from the Province of Fokien, and is different from that used for the tea chests at some other parts in China. The wood is cut into suitable lengths and stored in a dry place for at least a year, and sometimes two years, before use. Green wood is rarely used, as it invariably injures the tea, causing a distinct pine flavour known in the trade as "woodiness." I am informed that this flavour has never been found in Congou tea, but occasionally in the kind called Ping Suez. Tea is packed up-country generally in chests made of the wood of the "Fung" tree, by which name maple is generally understood, but it also applies to the Liquidambar. More precise information on the subject of country-packed tea will no doubt be supplied from Hankow and Kinkiang. The storing of the wood in a dry place for at least a year, no doubt, deprives it of the objectionable turpentine odour, which itself is far less prominent in some pines than it is in others. But Consul Oxenham of Chinkiang reported :—

The result of enquiries shows that the willow tree most commonly furnishes the wood used in China for making tea chests. It is cheap and abundant, is easily sawn into boards, holds nails well (not splitting when they are driven in), and does not exercise any corrosive action on the lead lining of the chests. Pine wood, which is equally cheap, has been also tried, but is found to be unsuitable for the purpose : it does not hold the nails, splits easily, is liable to exude turpentine and injure the lining, and when new shrinks and cracks.

Other woods, such as the chesnut and Huai or locust tree (*Styphonlobium*), are also equally available for the purpose, but are generally too scarce and dear to be much used. In a few places, however, where such trees are abundant, they are occasionally used, but never for long, as they are valuable both for ornamental and edible purposes. Now if by "willow," the or-

dinary willow is meant, we fear the information will be of little practical use to us here. But the "willow" in question may be a tree suitable for growth in Ceylon, and we have no doubt Dr. Trimen will address himself to this subject. We cannot forget that Mr. D. Morris of Jamaica wrote of *Ficus Benjamina* as "the Ceylon willow." Consul Jamieson of Kinkiang reported :—

I am informed that the wood universally used in this district for the above purpose is that known by the natives as the *Fung* tree. The Fung appears to correspond to the genus *Liquidambar*, of which there are several varieties. I am unable to say which is the more common in this neighbourhood, but all appear to be available for tea packing, the recommending feature being that this wood imparts no flavour to the tea. A large proportion of the best teas is exported from Kinkiang, the chests for which have all been manufactured locally for many years, and I have never heard complaints of any corrosive action on the lead lining.

Finally, we have a report from Officiating Consul Foster of Tamsuy, in favour of pine, thus :—

Seasoned common pine from the mainland portion of the Fokien Province is the wood most generally used within this Consular District for making the chests in which tea is exported to foreign countries.

Note that the pine is well-seasoned.

The *Gazette* contains a correspondence on this subject. Writing to the Colonial Office (London) on 29th March, Mr. Thiselton Dyer states :—

Sir Joseph Hooker would remind you that *Pinus sinensis*, the wood of which is apparently largely used by the Chinese for the purpose, answers extremely well for plantations in Hongkong and on the neighbouring Chinese mainland, and it has been recently introduced by His Excellency Sir J. Pope Hennessy into Mauritius. It is worth consideration whether its experimental cultivation might not be attempted where suitable land is available in Ceylon.

Mr. Thiselton Dyer had written to the Foreign Office in November 1883, as follows :—

I am desired by Sir Joseph Hooker to inform you that enquiries have been addressed to the Royal Gardens from Ceylon as to the nature of the wood used in China for making the chests in which tea is imported into this country. It is a matter of considerable commercial importance, as in some cases Indian Tea has proved irretrievably damaged on its arrival in this country owing to the corrosive action of the wood on the lead lining of the chests. The tea has consequently been unprotected from damp, and has further been deteriorated by a flavour communicated by the wood.

Under these circumstances, Sir Joseph Hooker is of opinion that it would be well worth the trouble, if the Secretary of State

should think fit to invite Her Majesty's Consuls in those parts of China from which tea is exported, to inquire into the matter and report, as far as they are able, as to the nature of the wood most generally in use. Perhaps the attention of Dr. Hance, whose knowledge of Chinese botany is so extensive and accurate, might be particularly directed to the question.

The reply from the Foreign Office on 28th March, 1884, was :—

With reference to the letter from this Department of the 5th of December last, I am directed by Earl Granville to forward to you herewith, for the inspection and use of Sir Joseph Hooker, a sample of the wood that is said to be exclusively used at Foochowfoo for making the chests in which tea is exported thence to this country.

In forwarding this sample, Her Majesty's Consul at that port states that it is the common pinewood of China (*Pinus sinensis*), and is produced principally in Tingchowfoo, a prefecture of the province of Fuhkien in the north-western direction, several hundred miles to the north of Foochow, where timber of this description grows in great abundance and is brought down the Min river in rafts, like those seen on the Rhine.

Mr. Sinclair adds that this wood is also greatly used for coffins in preference to any other on account of its consistency and durability.

Now if *Pinus sinensis* can be grown in Mauritius it can doubtless be grown in Ceylon. But if it is to compete with our suitable indigenous woods, it ought to grow readily and quickly. Perhaps Dr. Trimen can give some information about it? We have sought in vain for any notice of *Pinus sinensis* under that name. It does not seem to have been introduced into India?—*Indian Agriculturist.*

HEALTHFULNESS OF FORESTS.—A mountain cliff, a wall, or a forest, are the natural protection against the wind. In this respect the forest can not be without beneficial effect on the adjacent country; the young growth of trees flourishes, screened from the force of the wind, the arable land develops itself better, sands meet an impassable barrier, and the noxious influence of the dry winds is turned aside. It is, then, indisputable that the forests exercise a salutary influence on the temperature of a country. The sanitary condition of man and the domestic animals, as well as the growth of cultivated plants, depends on the climate of the locality. The fertility of a country depends on its supply of forest land; for on this depend the foundation of soil, the precipitation of dew, the fall of rain, the steady current of rivers, the mitigation of the evil influences of unhealthy winds, and the growth of vegetables in the fields and meadows.—SCHACHT.

Italy.—When the Apennine and Sabinian Mountain range and its slopes were covered with its natural growth of trees, the now detested Roman Campagnas, which constitute the largest part of the Pontine swamps, were a beautiful section of country. They were then adorned with sumptuous summer residences, villas, parks, flower and fruit gardens of the Roman aristocrats After the destruction of the forests, the whole region became unhealthy, and almost absolutely uninhabitable on account of the malarious gases emanating from the soil. Formerly, these were absorbed by the leaves of numerous trees; now they fill the air and infect even the very heart of St. Peter's eternal city. Within a few years a portion of these swamps have been planted with eucalyptus trees, and they have had a wonderful effect on the healthfulness of the atmosphere, and people now reside in these parts during the summer, where but a short time ago it was impossible to live. The eucalyptus tree is now being introduced into the everglades of Florida in order to purify the air in these unhealthy regions of the State.—PHIPPS.

Hanover.—In Hanover, a province of Prussia, there are 600,000 acres in the government forests, and the cost of working and all expenses, £130,000 annually; the receipts £300,000, and the profit £170,000. Here the steepest and most rocky sides of the hills are all covered with forests, which have been created by the labors of the Forest Department. In many such places, where even the few handfuls of soil placed round the young tree had to be carried some distance, it is not contended that the *first* plantation will yield a pecuniary profit, but the improvement in climate by the retention of the moisture, and the reclamation of large tracts, formerly barren and unproductive, is taken into account; besides which the dropping of leaves and needles from the trees will, ere long, create a soil and vegetation, and insure the success of plantations in future years.—PHIPPS.

Immense amount of Water given to the Atmosphere by Trees.—The amount of moisture given out by trees is immense. In some trees the upward rush of moisture from the roots is very powerful. The workmen in ship-yards frequently find in the centre of a teak log a core of sand 50 or 60 feet long, an inch in diameter, and hardened to a marble-like consistency, which has been carried and deposited there by the sap in its upward course.

A few years ago a number of scientists of New England made a calculation as to the amount of water given to the atmosphere by the "Washington Elm," Cambridge, Mass. They calculated that the leaves of that tree would cover over 200,000 square feet of surface, and that they gave out every

fair day during the growing season 15,500 lbs., or 7¾ tons, of moisture.—J. B. PEASLEE.

The Rain and Forests.—There is nothing of greater importance to the agriculturist than rain at the proper season and in proper quantity; and science has demonstrated that the forests of a country are potent in the regulation of storms, the formation of clouds, and the descent of rain. Any thing which vitally affects the interests of the farmer and producer affects the whole State, and demands the earliest attention of the people's representatives.—*New York Report of the Commissioners of State Parks.*

The Pine Tree.—

Old as Jove,
Old as Love,
Who of me
Tells the pedigree?
Only the mountains old,
Only the waters cold,
Only moon and star,
My cœvals are.
Ere the first fowl sung,
My relenting boughs among,
Ere Adam wived,
Ere Adam lived,
Ere the duck dived,
Ere the bees hived,
Ere the lion roared,
Ere the eagle soared,
Light and heat, land and sea,
Spake unto the oldest tree.

—EMERSON: "*Wood Notes.*"

The tremendous unity of the pine absorbs and moulds the life of a race. The pine shadows rest upon a nation. The northern peoples, century after century, lived under one or other of the two great powers of the pine and the sea, both infinite. They dwelt amidst the forests as they wandered on the waves, and saw no end nor any other horizon. Still the dark, green trees, or the dark, green waters jagged the dawn with their fringe or their foam. And whatever elements of imagination, or of warrior strength, or of domestic justice were brought down by the Norwegian or the Goth against the dissoluteness or degradation of the south of Europe were taught them under the green roofs and wild penetralia of the pine.—RUSKIN: "*Modern Painters.*"

PIPES.—The short clay pipe formerly used by smokers has of late years been to a great extent supplanted by the wooden pipe, the manufacture of which is now an important industry. Some interesting information respecting these pipes is given in Consul Inglis's trade report on Leghorn, whence the material for making wooden pipes is now largely exported. Similar works are also to be found at Siena and Grosseto. Selected roots of the heath (*Erica arborea*)—preference being given to the male variety—are collected on the hills of the Maremma, where the plant grows luxuriantly, and attains a great size. When brought to the factory the roots are cleared of earth, and any decayed parts are cut away. They are then shaped into blocks of various dimensions with a circular saw set in motion by a small steam engine. Great dexterity is necessary at this stage in cutting the wood to the best advantage, and it is only after a long apprenticeship that a workman is thoroughly efficient. The blocks are then placed in a vat, and subjected to a gentle simmering for a space of twelve hours. During this process they acquire the rich yellowish-brown hue for which the best pipes are noted, and are then in a condition to receive the final turning; but this is done elsewhere. The rough blocks are packed in sacks containing forty to one hundred dozen each, and sent abroad, principally to France (St. Cloud), where they are finished into the famous G.B.D., or "pipes de bruyère," known to smokers in England under the name of "briarwood" pipes. The production of this article is considerable, four hands turning out about sixty sacks per month. Consignments are also made to England and Germany; but, the Anti-tobacco Association will be glad to hear at present the demand is said to be rather slack.—*Timber Trades Journal.*

AUSTRALIAN TIMBERS.—It has repeatedly been asserted that Australia is deficient in timbers suitable for building and other industrial purposes, but the assertion is utterly without foundation. On the contrary, the various colonies, especially New South Wales, are rich in timbers of every possible description, many possessing a beautiful colour and grain, rendering them eminently suitable for decorative woodwork. Among the more plentiful of the New South Wales timbers are the following:—Ironbark, generally used for railway purposes and girder beams for buildings. The retail price is 2*s.* 6*d.* per cubic foot for girders, and £1 5*s.* per 100 superficial feet for sawn timber. Grey gum, generally used for building purposes, palings, and fencing, and is retailed at 18*s.* per 100 superficial feet. Marsh box, generally found in rich marshy ground, and is used for building purposes; price 18*s.* per 100 superficial feet retail. Blackbutt, greatly used for all kinds of house and ship-building purposes, and also for street-paving cubes; price 18*s.* per 100 superficial feet. Spotted gum, mostly used for shipbuilding,

owing to its long lengths and bending qualities; price 18*s.* per 100 superficial feet retail. Mahogany, used for fencing and general purposes, is considered to be able to stand a long time under ground; price 18*s.* per 100 superficial feet retail. Tallow-wood, one of the best timbers for building purposes that can be obtained in the Colonies, having a greasy nature resembling Indian teak, and sells at about the same price as ironbark. Blue gum, greatly used by wheelwrights, and also used for general purposes, and belonging to the best class of timber growing in this colony; price 18*s.* per 100 superficial feet retail. Colonial pine is largely used for all rough purposes in house building and box making, and also for flooring boards, and sells at present at £1 2*s.* per 100 superficial feet retail.—*Timber Trades Journal.*

GAMBLE'S INDIAN TIMBERS.—Mr. Lowrie has written to point out that in Ajmir *Cordia Rothii* has a heartwood, and that in *C. Rothii* and *C. MacLeodii* the rings of the heartwood differ from the annual rings.

These facts are not given in Mr. Gamble's book on Indian Timbers. We shall be glad to receive specimens of these woods from Mr. Lowrie for the Dehra Dún Forest School collection.

WE have noticed a resolution of the Government of India dated the 16th of August, under which it is ordered that all officers drawing a pay of Rs. 250 and over, whether gazetted or not, are entitled to the gratuitous medical attendance at their own residences from Civil Surgeons, and that gazetted as well as other officers drawing less than Rs. 250, are not entitled to gratuitous medical attendance, except in the case of Probationers under the Statutory Civil Service Rules, and Assistant Superintendents of Police drawing less than Rs. 250 a month. It is a great pity that Sub-Assistant Conservators of Forests were not included in the list of exceptions, considering that by the nature of their work, they are specially exposed to malaria and other causes of disease.

WE hear that Messrs. Shuttleworth, Fry, Fuchs, Mainwaring and Wroughton of the Indian Forest Department, are serving as jurors on the Edinburgh Forestry Exhibition.

IV. Extracts from Official Gazettes.

1.—Gazette of India—

No. 566.—*The 7th August, 1884.*—*Mr. J. S. Battie*, Sub-Assistant Conservator of Forests in Oudh, and officiating as an Assistant Conservator of the 3rd grade, is confirmed in the latter appointment, with effect from this date.

Mr. Battie's services are placed at the disposal of the Government of Madras.

No. 596.—*The 15th August, 1884.*—*Mr. R. L. Heinig*, Sub-Assistant Conservator of Forests in Bengal, and officiating as an Assistant Conservator of the 3rd grade, is confirmed in the latter appointment, with effect from the 14th July, 1884.

2.—Calcutta Gazette—

The 1st August, 1884.—*Mr. R. H. M. Ellis*, Deputy Conservator of Forests, having been permitted by Her Majesty's Secretary of State to return to duty before the expiration of the furlough granted to him in the Notification, dated the 26th March, 1883, reported his arrival at Calcutta on the afternoon of the 25th June, 1884, and assumed charge of the Chittagong Forest Division on the forenoon of the 15th July, 1884.

The 4th August, 1884.—*Babu Sreedhur Chuckerbutty*, Forest Ranger, is appointed a Sub-Assistant Conservator of Forests in Bengal, with effect from the 11th March, 1884.

3.—North-West Provinces Gazette—

No. $\frac{2147}{11\text{-}448\text{-}2\text{-}2}$.—*The 7th August, 1884.*—*Mr. C. J. Ponsonby*, Deputy Conservator of Forests, privilege leave for one month, with effect from the 1st September, 1884, or subsequent date.

No. $\frac{2152}{11\text{-}278\text{-}2}$.—*The 7th August, 1884.*—In Notification No. $\frac{545}{11\text{-}280}$, dated the 5th April, 1884, announcing the reversion of *Messrs. W. G. Allan, J. M. Braidwood*, and *N. Hearle*, to their substantive appointments, for "with effect from the 16th December, 1883, the date on which *Mr. C. J. Ponsonby*, officiating Deputy Conservator of Forests, 1st grade, was confirmed in that appointment," *read* "with effect from the 31st December, 1883, the date on which *Mr. W. R. J. Brereton*, Deputy Conservator of Forests, 1st grade, reported his return from furlough."

No. $\frac{2197}{11\text{-}421\text{-}22}$.—*The 13th August, 1884.*—With effect from the 1st March, 1884, *Mr. A. Campbell*, Assistant Conservator of Forests, 3rd grade, to be Assistant Conservator of Forests, 2nd grade.

4.—PUNJAB GAZETTE—

Nil.

5.—CENTRAL PROVINCES GAZETTE—

No. 3722.—*The 31st July, 1884.*—One month and six days' privilege leave, under Section 74 of the Civil Leave Code, is granted to *Mr. R. Whittall*, Deputy Conservator of Forests, Chanda Division, with effect from the 10th August next.

Mr. M. S. Fowler, Assistant Conservator of Forests, Chanda Division, is appointed to the charge of that Division during the absence of *Mr. Whittall*, or until further orders.

No. 3910.—*The 9th August, 1884.—Mr. W. Jacob*, Deputy Conservator of Forests, availed himself on the afternoon of the 18th ultimo of the privilege leave granted him by Notification No. 3103 of 27th June last, making over charge of the Seoni Forest Division to *Mr. Mahomed Ghouse*, Sub-Assistant Conservator of Forests.

No. 3965.—*Mr. R. H. C. Whittall*, Deputy Conservator of Forests, availed himself, on the afternoon of the 9th instant, of the privilege leave granted him by Notification No. 3722 of 31st ultimo, making over charge of the Chanda Forest Division to *Mr. M. S. Fowler*, Assistant Conservator of Forests.

6.—BRITISH BURMAH GAZETTE—

No. 35.—*The 31st July, 1884.*—The following transfer and appointment are ordered :—

Captain C. T. Bingham, Deputy Conservator of Forests, from the Rangoon to the Western Division.

Mr. E. P. Popert, Deputy Conservator of Forests, on his return from privilege leave, to the charge of the Rangoon Division.

No. 8.—*The 2nd August, 1884.—Captain C. T. Bingham*, Deputy Conservator, made over, and *Mr. E. P. Popert*, Deputy Conservator, received charge, of the Rangoon Division on the afternoon of the 24th instant.

No. 9.—*Captain C. T. Bingham*, Deputy Conservator, held joint charge of the Rangoon and Western Divisions from the 25th June to the 24th July, 1884.

No. 36.—*The 12th August, 1884.*—Under the provisions of section 66 of the Burma Forests Act, 1881, *Mr. H. B. Ward*, officiating Deputy Conservator of Forests, 4th grade, in charge of the Shwegôn subdivision, Salween Forest Division, is specially empowered to compound the forest offences mentioned in that section.

No. 37.—Under the provisions of section 70 of the Burma For-

est Act, 1881, the Chief Commissioner invests *Mr. H. B. Ward*, officiating Deputy Conservator of Forests, 4th grade, in charge of the Shwegôn subdivision, Salween Forest Division, with the following powers, that is to say—

(i). The powers of a Civil Court to compel the attendance of witnesses and the production of documents;

(ii). Power to issue search-warrants under the Code of Criminal Procedure;

(iii). Power to hold enquiries into Forest offences, and in the course of such enquiries to receive and record evidence.

No. 38.—*The 13th August, 1884.*—Under the provisions of section 50 of the Civil Leave Code, furlough to Europe on medical certificate for six months is granted to *Mr. J. N. Pickard*, Deputy Conservator of Forests, with effect from the 29th July, 1884.

7.—Assam Gazette—

No. 272.—*The 23rd July, 1884.*—Erratum.—In Notification No. 242, dated the 3rd July, 1884, after the name *Babu Jogesvar Sur*, for the words "Officiating Assistant Conservator of Forests," *read* "Officiating Sub-Assistant Conservator of Forests."

8.—Mysore Gazette—

No. 94.—*The 30th July, 1884.—Mr. J. Stephen*, Sub-Assistant Conservator of Forests, Hassan, having returned to duty and resumed charge of his office from *Mr. Prahlada Rao*, Forest probationer, on the afternoon of the 17th July, 1884, the unexpired portion of the privilege leave granted to him in this Office Notification No. 71, dated 11th July, 1884, is cancelled.

No. 116.—*The 15th August, 1884.—Mr. C. Narayana Rao*, Sub-Assistant Conservator of Forests, Bangalore District, is promoted to Assistant Conservator of Forests, 3rd grade, Local Establishment, with effect from 1st April, 1884.

9.—Madras Gazette—

The 28th July, 1884.—S. Tirunáráyana Aiyangár, Head Clerk, District Forest Office, Tinnevelly, to be a Forest Ranger, 5th grade, on probation for one year, from the 1st August, 1884, and do duty in the Tinnevelly Division *pro tem.*

The 30th July, 1884.—Mr. J. Hayman, Acting Forester 2nd grade, South Coimbatore Division, to act as Forest Ranger, 5th grade, in the same division, from the 1st June to the 31st July inclusive, during the absence of Ranger *Shams-úd-dín Sáhib* on leave on medical certificate.

The 31st July, 1884.—Mr. N. J. P. Gonsalves, Passed Student, First Class, Agricultural College, to act as Forest Ranger, 5th grade, in the South Coimbatore Division, to *join at once* and report himself to the District Forest Office, Coimbatore.

The 16th August, 1884.—*A. Shunmoogam Mudaliar*, Manager, Central Office of Accounts, is granted privilege leave of absence for one month on medical certificate from the 11th instant, under Section 138 of the Civil Leave Code.

A. Janakerama Mudaliar, Head Accountant, to act as Manager during the absence of *A. Shunmoogam Mudaliar*, on leave, or until further orders.

10.—BOMBAY GAZETTE—

The 25th July, 1884.—With reference to Government Resolution No. 5796, dated 18th July, 1884, Revenue Department, *Mr. Ganesh Sakharam Hinge* reported himself for duty as Acting Sub-Assistant Conservator of Forests, 3rd grade, to the Conservator of Forests, Northern Circle, on the 23rd instant, before office hours.

Mr. W. G. Clabby, Acting Sub-Assistant Conservator of Forests, South Thána, left Thána on the 15th instant, after office hours and reported himself for duty on the 16th idem to the Divisional Forest Officer, Násik.

The 1st August, 1884.—*Messrs. G. K. Shahné*, and *G. F. Blackwell*, Sub-Assistant Conservators of Forests, North Thána, respectively delivered over and received charge of the office and duties of Sub-Assistant Conservator of Forests on the 24th ultimo, after office hours.

Messrs. R. S. F. Fagan, Divisional Forest Officer, Ahmednagar, and *G. K. Shahné*, Sub-Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Ahmednagar, on the 28th ultimo, before office hours.

The 5th August, 1884.—With reference to Government Resolution No. 5796, dated 18th July, 1884, Revenue Department, *Mr. Haripad Mitra, L.C.E.*, reported himself for duty to the Conservator of Forests, Northern Circle, on the 24th ultimo, before office hours, and joined his appointment as Acting Sub-Assistant Conservator of Forests at Ahmednagar on the 29th idem, before office hours.

No. 6672.—*The 19th August, 1884.*—*Mr. R. C. Wroughton*, Deputy Conservator of Forests, 3rd grade, has been allowed by Her Majesty's Secretary of State for India to return to duty within the period of his leave.

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